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AUTHOR	Coats, Victoria; Samia, Cory
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ABSTRACT

This resource unit contains a teacher information packet and a middle school student activity packet to be used in creating a threatened and endangered species unit. The packet of student activities is designed to help maximize a field trip to the zoo and build on students' zoo experience in the classroom. The teacher information packet covers the topics of general and behavioral goals for the unit; extinction; vegetation zones or biomes (contains a world map); selected endangered and threatened animals listed by location in the wild and taxonomic classification; profiles of 30 selected animals with specific information on each species; zoos and endangered animals; protecting endangered species; and a list of 28 resources and a 27-word glossary. Fourteen student activities are divided into classroom and zoo sections. At the zoo, students are instructed to collect and record data from observations of animals and exhibits. Zoo-collected data are intended for later analysis and follow-up discussion in the classroom. A teacher's guide for each activity contains a list of the specific Oregon Comprehensive Curriculum goals addressed by that activity, and activity objectives, directions, and extension ideas. Teacher reproducible worksheets are provided for activities. (LZ)

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THE LIVING LAB
METRO WASHINGTON PARK ZOO

ED 376 063

THREATENED AND ENDANGERED SPECIES

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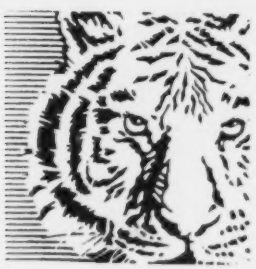
SE053144

TOUR PACKET

THREATENED AND ENDANGERED SPECIES

Written by Victoria Coats and Cory Samia

Produced by
the Education Division
Metro Washington Park Zoo
4001 SW Canyon Rd.
Portland, Oregon 97221



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The Zoo appreciates both the ARCO and the Oregon Community Foundations' support of its education programs.

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TEACHER INFORMATION PACKET

THREATENED AND ENDANGERED SPECIES

This packet of information provides resources for you to create a Threatened and Endangered Species unit for your class. It is primarily designed to assist you in preparation and contains more information than you will probably need. We hope it will help you develop an informative, relevant and positive program for your students.

We also hope that you include an educational field trip to the Zoo as part of your plan. The accompanying packet of activities is designed to help you receive the most from your Zoo visit and build on your students' Zoo experiences back in the classroom.

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STUDENT ACTIVITY PACKET

Grade-appropriate activities for students at the zoo and in the classroom.

Threatened and Endangered Species

The worst thing that can happen during the 1980s is not energy depletion, economic collapse, limited nuclear war or conquest by a totalitarian government. As terrible as these catastrophes would be for us, they can be repaired in a few generations. The one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly that our descendants are least likely to forgive us.

— Professor Edward O. Wilson, Harvard University

The terms "threatened" and "endangered" are not just expressions of concern but legal terms defined by state and federal laws and international treaties. An endangered species is in immediate danger of extinction; a threatened species is in decline and approaching the threat of extinction.

Threatened and endangered species are a strong warning signal of environmental decline. Each extinction leaves a gap in the web of life that sustains the earth. Each loss is irreplaceable. Many forces of human greed and human need are working against the preservation of the diversity of life on earth.

Threatened and endangered species can also be a powerful rallying point for environmental action. Endangered means there is still time. If we can save these species from extinction in the wild, much more will be saved as well. Habitats and watersheds will be protected, ecosystems and food webs preserved, and sustainable human development and resource use established.

We hope you will join us in learning about these problems and possibilities and determining your personal course of action.

General and Behavioral Goals

General Goals

To identify the variety of vegetation habitat zones found on the Earth.

To identify the dependence of each animal on a specific habitat.

To recognize that an animal is adapted for survival in its habitat.

To recognize human behavior and human values which endanger wildlife.

To identify factors which place animals at risk and recognize that habitat destruction is the critical factor.

To identify personal action which preserves habitat and protects endangered species.

Behavioral Goals

Students will be able to place endangered animals in the correct location and vegetation zone on a world map.

Students will be able to list the characteristics of an animal's habitat.

Students will be able to identify several endangered species and explain ways each is adapted to its environment.

Students will be able to list reasons for species decline and identify the human factors which are accelerating extinction.

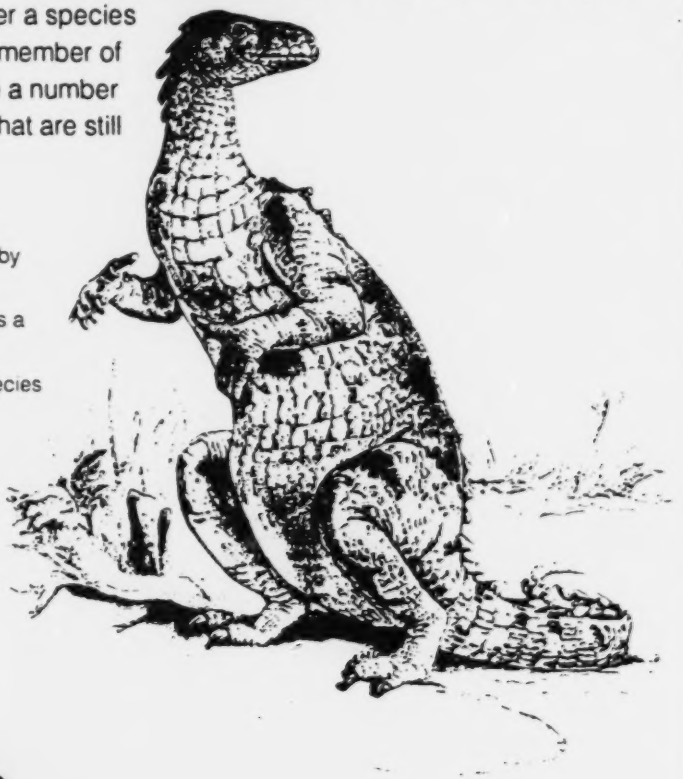
Students will be able to identify positive actions they can take to preserve habitat and protect endangered species.

Oregon Comprehensive Curriculum Goals

The first page of each activity in the Student Activity Packet identifies specific Oregon Comprehensive Curriculum Goals which are addressed by that activity.

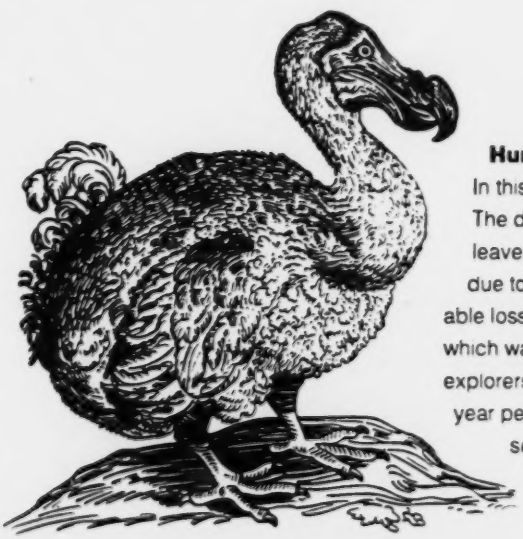
What is Extinction?

Extinction is the disappearance of an animal or plant species so that it no longer exists. The word extinction is used not only for the disappearance of a species but also for the disappearance of a subspecies, i. e., one or more races within a species. In turn, this usage has caused much confusion because when conservationists talk about extinctions, they often do not specify whether it took place or is taking place at the level of subspecies, species, family or order. It is worthwhile knowing whether a species facing extinction is the last remaining member of its family or order or whether there are a number of similar species in the same genus that are still surviving.



Natural Extinction

This is the dying out of a species by natural means. Usually when a species becomes extinct, it leaves a space in nature which can be occupied by a newly evolving species or a replacement species. An example of this is the disappearance of the dinosaurs 65 million years ago which left space for the mammals to arise.



Human-Influenced Extinction

In this case, a species dies out because of human interference. The dramatic increase in extinctions through human interference leaves little opportunity for new species to replace extinct ones due to the rapid pace of extinctions. Thus there may be irreplaceable loss. Examples of accelerated extinctions are the dodo bird which was wiped out within 62 years of its discovery by European explorers, the passenger pigeon which was exterminated over a 50-year period (originally this bird numbered in the billions) and Steller's sea cow which became extinct 27 years after its discovery in 1767.

Processes of Extinction by Human Interference

A. Direct: species are killed, trapped or collected by humans for various reasons:

1. food source
EXAMPLE: Sea turtles and their eggs are harvested for food.

2. clothing or ornaments
EXAMPLE: Spotted cats are killed for their pelts which are made into coats.

3. souvenirs for tourists
EXAMPLE: Elephants are poached for ivory which is used to make souvenirs.

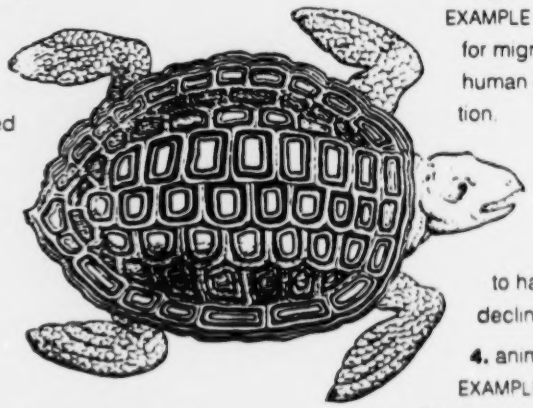
4. superstitious beliefs
EXAMPLE: Rhinoceros horn is made into traditional medicines in Asia; it has no demonstrated medicinal value.

5. animal trade
EXAMPLE: Chimpanzees are captured for the pet trade and medical research.

6. killing for sport or trophies
EXAMPLE: Polar bears were hunted from the air for sport prior to protection.

7. killing predators considered dangerous to livestock or humans
EXAMPLE: Gray wolves were all but exterminated in the continental U. S. by predator control programs.

8. Collecting rare specimens for private collections
EXAMPLE: Some exotic reptiles are threatened by overzealous private collectors.



B. Indirect: human activity damages or destroys the natural environment which species depend upon for survival

1. destruction of the natural vegetation
EXAMPLE: Land is cleared of natural vegetation by logging and agriculture.

2. drainage of wetlands
EXAMPLE: Wetlands, a vital habitat for migratory birds, are filled in for human development and construction.

3. pollution of the air, water and land
EXAMPLE: Damage to the ozone layer is thought to have caused a sudden decline in amphibians.

4. animal traffic victims
EXAMPLE: A 12-month study done in England showed that approximately 192,000 animals died on highways.

5. domestic animal diseases introduced to wild animals which lack immunity
example: Wild big horn sheep fell victim to the diseases of domestic sheep.

6. indirect victims of biocides (pesticides, herbicides, fungicides, insecticides)
EXAMPLE: Bald eagles were adversely affected by DDT when it became concentrated in their food chain.

7. human introduction of non-native species which compete with, or prey on, native species
EXAMPLE: Pet Eastern box turtles released in the Western U. S. compete with native species.

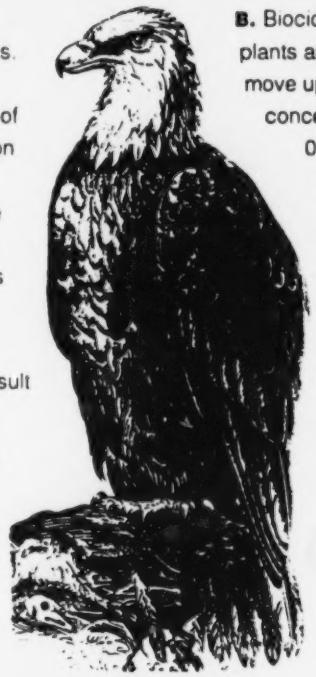
Important factors affecting extinction

A. The loss of habitat today is the largest factor affecting plant and animal extinctions.

1. Tropical forests cover only 7 percent of the Earth's surface but contain 60 percent of all species on Earth. The rate of destruction of tropical forests is estimated to be 100 acres/minute; at this rate the forests will be gone in 25-50 years. Latest estimates are that an area the size of Washington state is lost every year.

2. One half to one third of all extinctions projected to occur by the year 2000 will result from the loss of tropical forests.

3. As of 1950, up to one half of the world's woodlands may have vanished. The annual losses are now between 1 and 2%, which is 25-50 million acres a year.



B. Biocides, which are used to control unwanted plants and animals, are concentrated as they move up the food chain. For example, DDT concentrations in some water plants are only 0.1 parts per million while at the top of the food chain predatory birds may have concentrations as high as 45 parts per million. Many pest insects have developed resistance to widely applied biocides resulting in higher levels of application to continue control. Increasing use of biocides threatens many non-pest species who are in the same food web or habitat as the targeted pest.

Factors that make animals vulnerable to extinction

A. Species that often exhibit one or more of the following characteristics are often more prone to extinction than other species: large body size, specialized diet, slow reproductive rate and small population size. Large carnivores such as tigers are a good example. Because they are large and require considerable space in nature as well as a substantial food supply, there were fewer of them to begin with. When the tigers' habitat was reduced by human encroachment and prey became scarce, tigers became scarce as a result of their vulnerability.

B. Animals which live on island or isolated habitats created by water, rivers or geographical barriers seem to become extinct more readily. An isolated population is seldom equipped to deal with new or different species. Domestic animals and introduced predators or competitors can wipe out a vulnerable native species. For example, the giant tortoises on the Galapagos Islands are threatened by introduced goats which out-compete them for food.

C. Saved today, but not forever. Even if a species is protected from extinction today, either in a small portion of the wild or in captivity, it still may be too late for its long term survival because genetic problems often arise in a small breeding population. Inbreeding may cause an overall decrease in the health of the population; for example, infants may not survive or adults may be infertile.

Vegetation Zone/Biome Information

Understanding the Earth's vegetation zones, or biomes, is an important part of species conservation education. Biomes represent the major habitat zones which support the diversity of animal life. Preserving the diversity of vegetation zones and the variety of habitats within each zone and on each continent is important. Animals and plants in each vegetation zone need natural habitats to survive. If a specific habitat is damaged or destroyed, the animal will have no place to live in the wild. Preserving the diversity of habitats is the most critical task for saving endangered species.

What is a Biome?

Variations in rainfall and temperature, soil and topography create the diversity of terrestrial environments found on the Earth. We can divide the planet into major biomes based on the kind of plants which grow naturally in each zone. The major zones shown on the map are:

1. Mountains: Mountains exhibit a variety of different vegetation zones which change with elevation. In general, forests are replaced by tundra above timberline.

2. Tundra: The tundra is characterized by cold temperatures, scarce water and a layer of permafrost or permanently frozen earth just below the surface. The result is a cold semi-desert where only grasses and low shrubs grow.

3. Evergreen Forests: Coniferous trees dominate these forests which are found throughout the northern hemisphere.

4. Temperate Forests: A variety of broadleaf or deciduous trees grow in these forests. Four distinct seasons and moderate rainfall characterize the climate.

5. Chaparral: Low-growing shrubs or trees grow in these areas of abundant winter rain and dry summers.

6. Grasslands/Savannahs: Savannahs are tropical grasslands with scattered trees. Grasslands and savannahs have a distinct dry and wet season. Grasses and sedges are the dominant plants. Prairies and steppes are common examples of tropical grasslands. Savannahs are tropical grasslands with scattered trees.

7. Deserts: Deserts are dry and have limited plant life. Rainfall averages less than 10 inches (25 cm) a year. Daytime temperatures rise above 100 degrees F (38° C) and nights can be freezing.

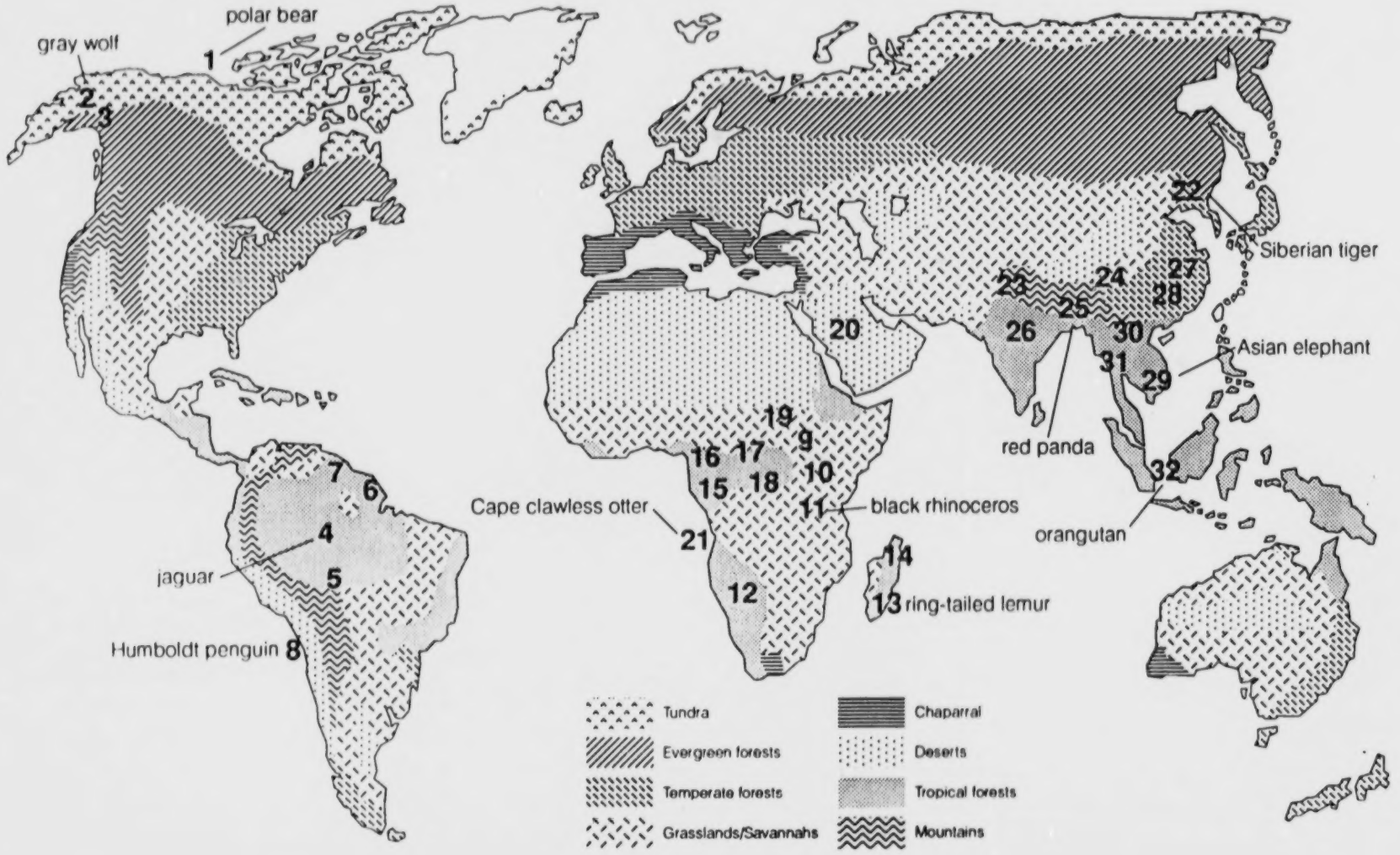
8. Tropical Forests: Tropical forests have year-round warm temperatures and abundant or seasonal rainfall. Depending on the volume and distribution of rain during the year, the resulting forest is a rainforest, seasonal wet forest or tropical woodland.

The vegetation zone map presents a big, generalized picture of the diversity of life on earth. In reality the diversity of life and of habitats is much more complex. Within each biome are many variations on the major theme of desert or forest. Each species depends on a specific habitat for survival. This habitat may be an extremely specialized part of a very isolated and limited kind of tropical forest. For example, the lemurs are found only in the tropical forests of the island of Madagascar. At the other extreme, some species habitat may include several biomes. The gray wolf, for example, once lived successfully in every kind of temperate vegetation zone in the northern hemisphere.

World Map of Vegetation Zones/Biomes

for use with the **Where in the World?** activity

This map divides the earth into eight major biomes or vegetation zones. Each biome is characterized by a specific type of plant growth.



The numbers on the map show the location of each of the 32 species as listed in **Endangered/Threatened Animal Locations in the Wild.**

Endangered/Threatened Species Inventory and Location at the Zoo

March 1990

"Endangered" and "threatened" are USDI (U.S. Department of the Interior) Fish and Wildlife designations. Appendix I and II are CITES (Convention on International Trade in Endangered Species) designations. Look in *Alphabet Soup* to find out more about these organizations.

Please note that the status of endangered and threatened species is subject to rapid change. Also keep in mind that some of these animals may not be on display during your visit. Animals which are used in zoo programs, including many of the birds of prey and reptiles, are not kept on exhibit. In addition, the zoo collection changes as new exhibits and programs are added and as old ones are retired.

The following animals are: ENDANGERED OR CITES APPENDIX I

Endangered and/or Appendix I species are considered presently threatened with extinction.

Big Cats
*jaguar
*Siberian tiger
*snow leopard

Penguins
*Humboldt penguin

Bears
*Malayan sun bear
*Asiatic black bear

Primates
*ring-tailed lemur
*red ruffed lemur
*diana monkey
*mandrill
*Hanuman's langur
*Francois' leaf-monkey
*white-cheeked gibbon
*siamang
*orangutan
chimpanzee

Elephants
*Asian elephant

Africa
*black rhinoceros

Alaska Tundra
*gray wolf

Birds of Prey
gyrfalcon

Africa
L'Hoest's monkey
slender-snouted crocodile

*These Zoo animals are featured in the activities included in this packet.

The following animals are: THREATENED OR CITES APPENDIX II

Threatened and/or Appendix II species are in danger of being threatened with extinction if their trade is not regulated.

Big Cats
*lion
*serval
*red panda

Bears
*Polar bear
Kodiak bear

Primates
*black-tailed marmoset
*brown-headed tamarin
*red-handed tamarin
*colobus monkey

Africa
Cape clawless otter
*Hartmann's mountain zebra
*DeBrazza's monkey
Bell's hingeback tortoise
savannah monitor
giant day gecko
Nile monitor
rock python

Alaska Tundra
*grizzly bear
short-eared owl
snowy owl

Cascades Stream and Pond Exhibit
North American otter
American golden eagle
great horned owl

Birds of Prey
red-tailed hawk
Harris' hawk
American kestrel
barn owl

Other Birds
grand eclectus parrot
mealy Amazon parrot

Reptiles
Nile monitor
Burmese python
coastal rosy boa
red-tailed boa
rainbow boa
South American red-footed tortoise

*These Zoo animals are featured in the activities included in this packet.

Endangered/Threatened Animal Locations in the Wild

This list of 32 selected endangered and threatened animals is organized by continent and vegetation zones. These Zoo animals are featured in the activities included in this packet.

Arctic Ice Cap
1. polar bear

North American forests/tundra
2. gray wolf
3. grizzly bear

South American tropical forests
4. jaguar
5. black-tailed marmoset
6. brown-headed tamarin
7. red-handed tamarin

South American Islands
8. Humboldt penguin

African savannahs
9. serval
10. lion
11. black rhinoceros
12. Hartmann's mountain zebra (SW Africa)

African tropical forests
13. ring-tailed lemur (Madagascar)
14. red-ruffed lemur (Madagascar)
15. diana monkey
16. mandrill
17. chimpanzee
18. DeBrazza's monkey
19. colobus monkey
20. L'Hoest's monkey
21. Cape clawless otter

Asian forests/mountains
22. Siberian tiger (Soviet Far East)
23. snow leopard (central Asian mountains)
24. Asiatic black bear (central Asian mountains)
25. red panda (SE Himalayas)

SE Asian tropical forests
26. Hanuman's langur
27. Francois' leaf-monkey
28. Malayan sun bear
29. Asian elephant
30. white-cheeked gibbon
31. siamang
32. orangutan

Endangered/Threatened Animal Classification

This list of 32 selected endangered and threatened animals is organized by taxonomic classification. These zoo animals are featured in the activities included in this packet.

CLASS MAMMALIA

ORDER CARNIVORA

Canidae (Doglike Carnivores)
1. gray wolf

Ursidae (Bears)
2. grizzly bear
3. polar bear
4. Asiatic black bear
5. Malayan sun bear

Procyonidae (Raccoon-like Animals)
6. red panda

Felidae (Cats)
7. jaguar
9. serval
9. lion
10. Siberian tiger
11. snow leopard

Mustelidae (Weasels)
12. Cape clawless otter

ORDER PROBOSCIDIA (Elephants)

Elephantidae (Elephants)
13. Asian elephant

ORDER PERISSODACTYLA (Odd-toed Hoofed Mammals)

Equidae (Horselike Mammals)
14. Hartmann's mountain zebra

Rhinocerotidae (Rhinoceroses)
15. black rhinoceros

ORDER PRIMATES

Lemuridae (Lemurs)
16. ring-tailed lemur
17. red-ruffed lemur

Cebidae (Larger New World Monkeys)
18. brown-headed tamarin
19. red-handed tamarin

Callithricidae (Marmosets)
20. black-tailed marmoset

Cercopithecidae (Old World Monkeys)
21. diana monkey
22. DeBrazza's monkey
23. colobus monkey
24. Hanuman's langur
25. Francois' leaf-monkey
26. white-cheeked gibbon
27. siamang
28. mandrill
29. L'Hoest's monkey

Pongidae (Anthropoid Apes)
30. chimpanzee
31. orangutan

CLASS AVES

ORDER SPENISCIFORMES (Penguins)

Spheniscidae
32. Humboldt penguin

Endangered/Threatened Animal Profiles

This alphabetical list of the 30 selected animals provides specific information for each species. These Zoo animals are featured in the activities included in this packet. The Animal Profiles are an excellent source of further information for the student activities.

ASIAN ELEPHANT

STATUS: ENDANGERED

LOCATION/HABITAT

Asian elephants live in a variety of habitats from thick jungles to open, grassy plains. They are found in Southeast Asia from India to Vietnam. In the wild they eat a variety of vegetation including fruits, grasses, leaves and shoots.

WHY ENDANGERED?

The destruction of tropical forests and encroachment of human development threaten the Asian elephant's habitat. Many existing reserves are too small to contain elephant herds or tend to isolate small populations. In general, none of the parks or reserves protect more than a portion of the local population for a part of the year.

WHAT IS BEING DONE?

The Asian elephant is listed in CITES Appendix I and is protected by law in most countries within its range. The Zoo participates in the Species Survival Plan (SSP) for this species.

WHAT SHOULD BE DONE?

Special reserves are needed to combat the threat of habitat destruction and consolidate fragmented populations. Protected forest corridors should also be established to safeguard the routes of major seasonal movements.

ASIATIC BLACK BEAR

STATUS: ENDANGERED

LOCATION/HABITAT

The Asiatic black bear occurs in moist deciduous forests in mountainous regions of Asia from Iran through the Himalayas to Japan. Black bears have an omnivorous diet of fruits, nuts, small mammals, birds and insects.

WHY ENDANGERED?

They are threatened by habitat loss and some subspecies face extinction. These bears have also been hunted because they are viewed as a threat to humans and livestock.

WHAT IS BEING DONE?

The Asiatic black bear is listed in CITES Appendix I.

WHAT SHOULD BE DONE?

Sufficient habitat must be protected to sustain a viable population.

BLACK RHINOCEROS

STATUS: ENDANGERED

LOCATION/HABITAT

The black rhinoceros is found in the savannah and forest of Africa from Somalia in the north to the Cape in the south. Rhinos browse on leaves and twigs and need a daily source of water.

WHY ENDANGERED?

Their range and numbers have declined drastically in the last 20 years. The rhinoceros is considered by many to be the world's most endangered mammal due to severe poaching and habitat destruction. Rhinoceros are hunted for their horns which are in demand in the Middle East for ceremonial dagger handles and in Asia for traditional medicines.

WHAT IS BEING DONE?

This species is listed in CITES Appendix I. Zoos, including the Washington Park Zoo, are cooperating to breed rhinos in captivity. Small groups of rhinoceros are protected on reserves by armed guards and private ranchers have set aside land as well. Some countries have agreed (on paper) to stop allowing the import of rhino horns. The Zoo participates in the Species Survival Plan (SSP) for this species.

WHAT SHOULD BE DONE?

Eliminating this trade and rigorously protecting their habitat is necessary to save rhinos in the wild. Realistically, captive breeding may be their only hope for survival. It is estimated that less than 1,000 survive in the wild.

BLACK-TAILED MARMOSET

STATUS: THREATENED

LOCATION/HABITAT

Marmosets live in the tropical rainforest of the Amazon basin, Bolivia and Paraguay. They live on an omnivorous diet of fruit, tree sap, flowers, insects, eggs and small animals.

WHY ENDANGERED?

They are endangered by rapid and accelerating destruction of their tropical forest habitat. This species is very vulnerable because of its limited distribution.

WHAT IS BEING DONE?

The exportation of primates was banned in many South American countries in the 1970s.

WHAT SHOULD BE DONE?

The destruction of tropical forest habitat for short-term economic gain must be stopped. Reserves should be set aside to protect primate habitat in the Amazon.

BROWN-HEADED TAMARIN

STATUS: THREATENED

LOCATION/HABITAT

Brown-headed tamarins live in the tropical forests of the Amazon basin, Bolivia, Ecuador and Peru. They eat an omnivorous diet of fruit, flowers, insects, lizards and frogs.

WHY ENDANGERED?

The tamarin is endangered due to widespread and rapid human destruction of tropical forests.

WHAT IS BEING DONE?

The exportation of primates was banned in many South American countries in the 1970s.

WHAT SHOULD BE DONE?

The destruction of tropical forest habitat for short-term economic gain must be stopped. Reserves should be set aside to protect primate habitat in the Amazon.

CHIMPANZEE

STATUS: ENDANGERED

LOCATION/HABITAT

Chimpanzees live in humid forests, woodlands with deciduous trees and savannahs in West and Central Africa north of the Zaire River.

WHY ENDANGERED?
Chimpanzee habitat is being destroyed for farming, logging and road building. The increasing human population kills them as food and hunts them as "pets" for the tourist trade. Profit can also be made by selling chimpanzees to medical researchers.

WHAT IS BEING DONE?
Chimpanzees are protected by law in all African countries where they live. Trade of these primates among countries is carefully regulated by the CITES treaty. The Zoo participates in the Species Survival Plan for chimpanzees.

WHAT SHOULD BE DONE?
More protected areas, especially large national parks and reserves, and better management of existing areas would provide habitat for more chimpanzees. Local populations should be educated about the importance of primate conservation to the ecosystem. Different ways of managing forests to preserve plant diversity would provide more food for chimps. Scientists and managers should be trained about using chimpanzees from captive breeding programs in limited medical research. Export controls, such as those of CITES, can be better monitored. More public support of centers that reintroduce chimps to their wild habitat is necessary. Wild populations of chimpanzees can be better monitored to provide information about management.

COLOBUS MONKEY

STATUS: ENDANGERED

LOCATION/HABITAT
This monkey is found in wooded grasslands and forests of Central Africa.

WHY ENDANGERED?
Habitat is being destroyed as an increasing African population needs food. Colobus were heavily hunted for their fur in the 19th and early 20th centuries; colobus coats were a fad during the roaring 1920's.

WHAT IS BEING DONE?
A reserve has been established in Kenya. Trade of colobus among countries is strictly regulated by the CITES treaty.

WHAT SHOULD BE DONE?
More reserves should be established.

DEBRAZZA'S MONKEY

STATUS: PROTECTED

LOCATION/HABITAT
This monkey is found in swampy forests that are flooded during the rainy season. It prefers the very thick vegetation next to a river. DeBrazza's monkey is found in central Africa from the country of Cameroon to southern Ethiopia and south through the countries of Zaire and north Angola.

WHY ENDANGERED?
This monkey's habitat is being destroyed and divided up for farming, especially coffee bean plantations, and logging. It is also captured as a pet. It is hunted for food in Zaire.

WHAT IS BEING DONE?
Trade of DeBrazza's monkey among participating countries is strictly regulated by the CITES treaty. It is illegal to hunt or trap this monkey in Ethiopia and other countries. The monkey is protected on the Dja Reserve in Cameroon.

WHAT SHOULD BE DONE?
Larger areas of habitat should be protected since during times of drought the monkey migrates to look for water. Since the protected habitat is fragmented, during migration the monkey is susceptible to hunting off the reserve.

DIANA MONKEY

STATUS: ENDANGERED

LOCATION/HABITAT
Diana monkeys can be found in the upper levels (high canopy) of forests in the African countries of Sierra Leone to Southwest Ghana.

WHY ENDANGERED?
Their forest habitat is destroyed by logging. The monkeys are eaten as food, killed for their fur and as pests because farmers think they eat crops in areas that grow coffee and cacao (the tree that produces chocolate).

WHAT IS BEING DONE?
The Ivory Coast in Africa has established Tai National Park and banned hunting of Diana monkeys. In Liberia, females who have young or are pregnant are protected.

WHAT SHOULD BE DONE?
Larger areas of habitat should be preserved. All hunting should be banned. The local farmers and hunters should be educated about the value of this primate. Reserves and other protected areas require better controls.

FRANCOIS' LEAF-MONKEY

STATUS: ENDANGERED

LOCATION/HABITAT
This monkey lives in the moist forests of Vietnam and China.

WHY ENDANGERED?
Its forest habitat was destroyed by logging and bombing during the Vietnam war. The monkeys are also overhunted as food.

WHAT IS BEING DONE?
Hunting is prohibited by law in China.

WHAT SHOULD BE DONE?
Protected reserves need to be established in Vietnam and China. The local populations of both countries need training on how to protect and conserve this primate and its habitat. If scientists in Asia study in other countries and western scientists study the leaf-monkey's habitat, more information about protection could be developed from the shared research.

GRAY WOLF

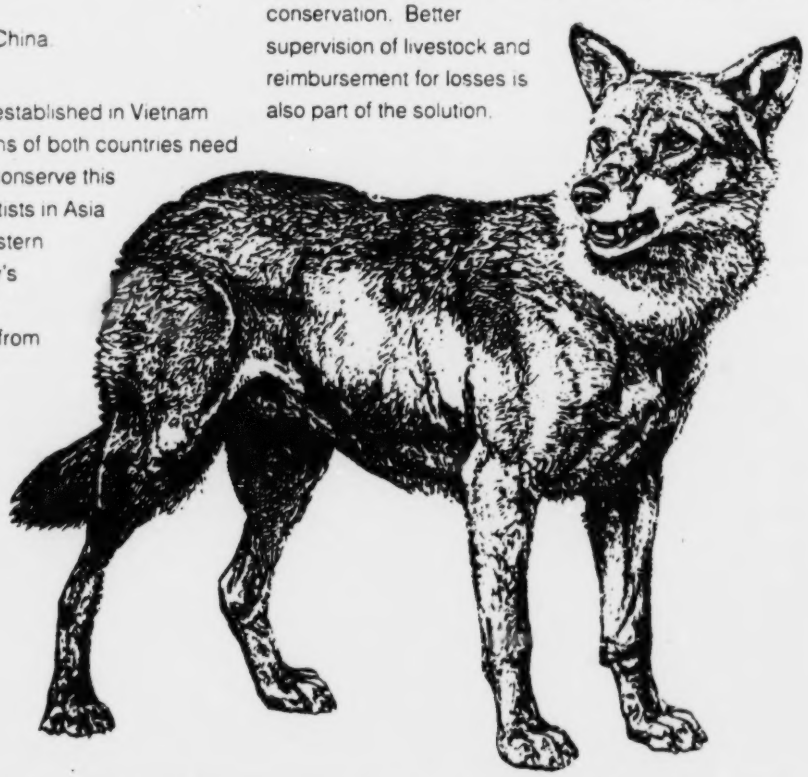
STATUS: ENDANGERED

LOCATION/HABITAT
The gray wolf had one of the largest natural ranges of any living terrestrial mammal. Its current range in North America is limited to tundra and forest regions in Alaska and Northern Canada and very limited areas in Minnesota, Wisconsin and Michigan. They prey on everything from mice to moose, but their major food source is caribou.

WHY ENDANGERED?
Wolves are endangered in the continental United States due to habitat destruction and past extermination programs to control predators. Wolves are traditionally viewed as evil and destructive to livestock and agriculture.

WHAT IS BEING DONE?
Rep. Wayne Owens introduced HR 3378 bill which requires the National Park Service to reintroduce the wolf within three years. The reintroduction of wolves to Yellowstone National Park has been extensively studied.

WHAT SHOULD BE DONE?
Reintroduction of wolves into protected habitat (ie. national parks) and a change in the common perception of wolves as "evil" are two important steps toward wolf conservation. Better supervision of livestock and reimbursement for losses is also part of the solution.



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GRIZZLY BEAR

STATUS: ENDANGERED

LOCATION/HABITAT

The grizzly bear is found on the tundra and rainforest islands of Canada and Alaska, and in mountains such as the Rockies of the western United States and Canada.

WHY ENDANGERED?

When land was cleared for cattle ranching, much of the grizzly's habitat was destroyed. This bear is hunted as big game and to control its preying on livestock. The grizzly's habitat in Canada is being drilled for oil and gas. Poor land use management in Alberta destroys bear habitat.

WHAT IS BEING DONE?

Trade of grizzly bears among participating countries is strictly regulated by the CITES treaty. The bear is protected in national parks in the United States.

WHAT SHOULD BE DONE?

Strong local, regional and national support is needed for the long-term survival of the grizzly bear in the 48 states. Better law enforcement needs to be funded. The province of Alberta in Canada needs better land-use laws that take into account grizzly habitat.

HANUMAN'S LANGUR

STATUS: ENDANGERED

LOCATION/HABITAT

This monkey lives in the forests, scrubby lands, cultivated fields and even in villages and town centers of Asian countries such as northwest India, Bangladesh and Sri Lanka.

WHY ENDANGERED?

Farmers hunt the primate because it eats their crops. In the poverty-stricken countries of this monkey's range, people eat them as food.

WHAT IS BEING DONE?

Trade of Hanuman's langur is strictly regulated by the CITES treaty.

WHAT SHOULD BE DONE?

More protected habitat such as national parks should be established. Some are proposed in Nepal and India. Hunting should be better controlled.

HARTMANN'S MOUNTAIN ZEBRA

STATUS: THREATENED

LOCATION/HABITAT

This species of zebra is native to rocky, dry mountainous or hilly areas of Southwest Africa.

WHY ENDANGERED?

Zebras were killed by farmers who viewed them as competition for their domestic livestock. This species has a very limited range.

WHAT IS BEING DONE?

This species is listed in CITES Appendix II and national parks provide protection in the wild. The Washington Park Zoo is one of only four zoos which exhibit this species. The Zoo also participates in the Species Survival Plan for Hartmann's mountain zebra which includes captive breeding.

WHAT SHOULD BE DONE?

The reserves should be expanded to allow for population growth. Illegal hunting and killing by farmers must be prevented.

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HUMBOLDT PENGUIN

STATUS: ENDANGERED

LOCATION/HABITAT

This relatively warm water penguin is found on the offshore islands on the western coast of South America near the country of Peru.

WHY ENDANGERED?

Humboldt penguins like to dig out their nests in compacted bird droppings called guano. Enormous quantities of guano have been hauled away from the islands and sold as fertilizer. Therefore, their nesting habitat has been destroyed. Penguins are sometimes eaten as food. When the warm current called El Nino moves closer to shore, less fish is available as food for the penguins.

WHAT IS BEING DONE?

Guards have been set up to protect the penguins' nesting habitat. The government of Peru manages the amount of guano that can be hauled off the islands. Penguins are now protected from hunting and more research is done on how to encourage breeding in zoos and other programs. The Metro Zoo participates in the Species Survival Plan for the Humboldt penguin.

WHAT SHOULD BE DONE?

The laws protecting the nesting areas can be better enforced. More information should be collected on the existing wild populations. The local population should be educated on how to better conserve the penguins and their habitat.

JAGUAR

STATUS: ENDANGERED

LOCATION/HABITAT

Jaguars live in tropical forests, swamps and savannahs from Mexico to South America. They eat a variety of mammals, reptiles and fish. They are now nearly extinct in Mexico, Central America, Uruguay and Argentina.

WHY ENDANGERED?

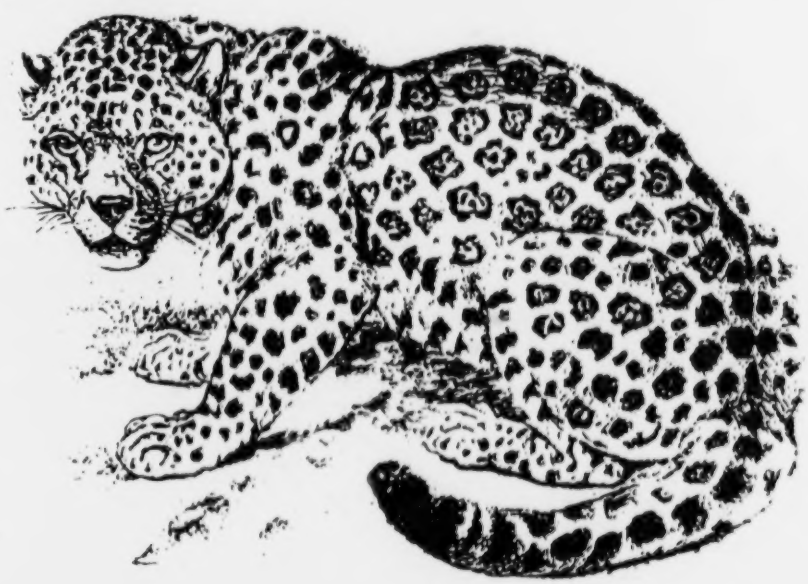
Jaguars are endangered because of habitat loss and hunting by humans. They are hunted for their fur and persecuted as a predator.

WHAT IS BEING DONE?

Although listed in CITES Appendix I, jaguars are still killed for their pelts. The first jaguar reserve was established in Belize in the 1980s with funds from the World Wildlife Fund.

WHAT SHOULD BE DONE?

More reserves are needed, the fur trade must be eliminated and the local human population needs more conservation education. Predator management must be improved and the population dynamics of jaguars in the wild should be researched. Little is known about jaguars because of the difficulty of studying these secretive, nocturnal animals in remote hostile habitats.



LION

STATUS: ENDANGERED

LOCATION/HABITAT

Lions are found in open and lightly wooded grasslands, called savannahs, of Central and East Africa.

WHY ENDANGERED?

Lions are hunted as big game and because they kill grazing and browsing animals such as antelope, zebras, buffalos, hippopotamus and giraffes. They are poisoned by livestock owners. The rapidly expanding human population in Africa is taking over land, food and water resources.

WHAT IS BEING DONE?

National parks and preserves have been set up in Africa.

WHAT SHOULD BE DONE?

The parks should be better monitored to prevent poaching. The local population should be educated about the value of preserving species like the lion. A sustainable development program for Africa should be developed to allow for wildlife and humans to live in the same habitat.

MALAYAN SUN BEAR

STATUS: ENDANGERED

LOCATION/HABITAT

Malayan sun bears live in the tropical and subtropical forests of Southeast Asia. They make their homes in trees and eat fruit, insects, honey, rodents and plants.

WHY ENDANGERED?

The population is declining due to habitat destruction.

WHAT IS BEING DONE?

This species is listed in CITES Appendix I.

WHAT SHOULD BE DONE?

Tropical forest habitat must be preserved for this species.

MANDRILL

STATUS: ENDANGERED (EXTREMELY)

The mandrill is considered to be among the most threatened monkeys in Africa.

LOCATION/HABITAT

Mandrills are found in the rainforests of southern Cameroon, Gabon and the Congo in Africa.

WHY ENDANGERED?

The rainforest habitat is being destroyed by farming, logging and road building. The rapidly expanding African population causes increasing pressure on the habitat and kills this monkey as food.

WHAT IS BEING DONE?

Several protected reserves have been established in Gabon.

WHAT SHOULD BE DONE?

The reserves that are protected should be changed into national parks. Larger protected areas should be established. Local personnel who manage the reserves should be educated about conservation measures.

ORANGUTAN

STATUS: ENDANGERED (EXTREMELY)

LOCATION/HABITAT

The orangutan lives only in the lowlands and hilly areas of tropical rainforests on the islands of Sumatra and Borneo.

WHY ENDANGERED?

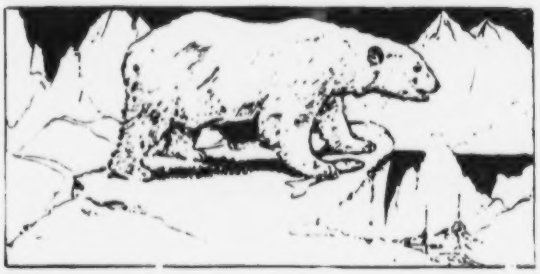
They live in a relatively small area and their rainforest habitat is being destroyed.

WHAT IS BEING DONE?

The CITES treaty prevents the trade of orangutans in the countries who signed it. The Zoo participates in a Species Survival Plan for the orangutan.

WHAT SHOULD BE DONE?

Protected reserves and parks should be established on the islands of Sumatra and Borneo. The population of these two countries and concerned world citizens should look for solutions to rainforest destruction.



POLAR BEAR

STATUS: THREATENED

LOCATION/HABITAT

Polar bears live on the edges of the Arctic ice cap. They prefer ice which is periodically fractured by wind and sea currents where seals are abundant. Seals are their primary food source which is supplemented by fish, small rodents, plants and berries.

WHY ENDANGERED?

The population has stabilized, but polar bears are still considered vulnerable because of increasing human development and pollution of the Arctic (i.e.oil spills). Damage to the limited number of suitable denning sites for pregnant females is the most critical threat to the bears.

WHAT IS BEING DONE?

The polar bear population is stable due to a 1973 agreement between Arctic nations which restricts hunting, protects habitat and promotes cooperative research.

WHAT SHOULD BE DONE?

The development of the Arctic should be limited to prevent pollution and habitat damage. Wildlife refuges must be maintained as off limits to mineral exploration.

RED PANDA

STATUS: THREATENED

LOCATION/HABITAT

Red pandas live in bamboo thickets and mountain forests on the southeastern slopes of the Himalayas. The have an omnivorous diet of bamboo, plants, berries, fruits, birds, eggs, rodents and insects.

WHY ENDANGERED?

The population of red pandas is declining due to deforestation and development of land for agriculture.

WHAT IS BEING DONE?

The panda is listed in CITES Appendix II and China has taken some steps toward preserving the species. The popularity of the giant panda has brought favorable attention to this species as well. The Zoo participates in the Species Survival Plan (SSP) for this species.

WHAT SHOULD BE DONE?

Red pandas live in remote, rugged areas, and little is known about the existing wild population. More research is needed and, of course, adequate habitat should be preserved.

RED-HANDED TAMARIN

STATUS: THREATENED

LOCATION/HABITAT

The red-handed tamarin lives in tropical forests of the Amazon basin found in Brazil, Surinam, Guyana and French Guiana. Their diet consists of fruit, flowers, insects, lizards and frogs.

WHY ENDANGERED?
They are increasingly threatened by the destruction of tropical forests.

WHAT IS BEING DONE?
The exportation of primates was banned in many South American countries in the 1970s.

WHAT SHOULD BE DONE?
The destruction of tropical forest habitat for short-term economic gain must be stopped. Reserves should be set aside to protect primate habitat in the Amazon.

RED-RUFFED LEMUR

STATUS: ENDANGERED

LOCATION/HABITAT
This lemur is found only in the rainforests of Madagascar.

WHY ENDANGERED?
The Madagascar rainforest is being destroyed for farming and logging. The last reserve for this primate was released from protection. The rapidly expanding population kills the lemur for food.

WHAT IS BEING DONE?
The international CITES treaty regulates trade of the red-ruffed lemur. In Madagascar, the lemur is now legally protected from hunting, trapping and trading. Conservationists around the world are trying to apply pressure on Madagascar to preserve its fast disappearing rainforests. Research about the interaction between lemurs and their habitat is being done. The Zoo participates in a Species Survival Plan for the red-ruffed lemur.

WHAT SHOULD BE DONE?
Protected reserve boundaries should be expanded when possible. A new reserve just for the red-ruffed lemur should be established and more surveys should be done on existing populations. If money can be found to hire more guards and if penalties for lemur killing were made harsher, the lemur could be better protected.

RING-TAILED LEMUR

STATUS: THREATENED

LOCATION/HABITAT
This primate is found in the deciduous forests and scrubby areas of Madagascar.

WHY ENDANGERED?
Most of the rainforest on the island of Madagascar is being destroyed by farming and logging. The trees that are replanted are not suitable for lemurs. This primate is also eaten for food by a rapidly increasing human population.

WHAT IS BEING DONE?
The CITES treaty regulates trading of the ring-tailed lemur. Some protected reserves have been established. Conservationists around the world are trying to apply pressure on Madagascar to preserve its fast disappearing rainforests. Research about lemurs is being done.

WHAT SHOULD BE DONE?
The boundaries of reserves should be more clearly outlined. Funds for police protection of the lemurs should be found. The local population should be informed about conservation projects that are realistic with their circumstances.

SERVAL

STATUS: ENDANGERED

LOCATION/HABITAT
This small cat is found in open grasslands near water holes in the bush country of Africa.

WHY ENDANGERED?
When the CITES treaty was successful in controlling the killing of the large cats like jaguars for their fur, pressure increased on killing smaller, beautifully patterned cats. It is hunted as a livestock pest in the farming areas of East and South Africa.

WHAT IS BEING DONE?
All the small cats are now protected by the CITES treaty.

WHAT SHOULD BE DONE?
The population of the bush country should be educated on conservation methods. Reserves should be established to protect the serval's habitat.

SIAMANG

STATUS: ENDANGERED

LOCATION/HABITAT
This primate is found in the rain and monsoon forests of the Malay Peninsula and Sumatra.

WHY ENDANGERED?
Their forest habitat is being destroyed for farming and other human activities. Siamangs are hunted as food and commerce.

WHAT IS BEING DONE?
An association of zoos, the AAPZA, has begun the process for developing a Species Survival Plan to breed siamangs in captivity.

WHAT SHOULD BE DONE?
Protected areas of siamang habitat should be established as preserves.

SIBERIAN TIGER

STATUS: ENDANGERED

LOCATION/HABITAT

Siberian tigers live in the rocky mountain woodlands of the Soviet Far East and North Korea. They live on a variety of wild mammals and fish and have been known to kill domestic livestock. Currently there are more animals in zoos than in the wild.

WHY ENDANGERED?

Siberian tigers are declining due to logging of their forest habitat and hunting both for their fur and to eliminate their threat to domestic animals.

WHAT IS BEING DONE?

They are listed in CITES and protected in Russia but reserves are small and populations are isolated. The Zoo participates in the Species Survival Plan (SSP) for the Siberian tiger.

WHAT SHOULD BE DONE?

Zoo breeding is an important part of the effort to save this species from extinction.

SNOW LEOPARD

STATUS: ENDANGERED

LOCATION/HABITAT

The snow leopard lives in Central Asian mountainous areas above timberline from 6,000 to 18,000 feet elevation. It preys on wild sheep, musk deer, hares, rodents, birds and some domestic stock.

WHY ENDANGERED?

It is killed by humans for fur trade profit and protection of livestock. Human encroachment is threatening its habitat and competing for its food supply.

WHAT IS BEING DONE?

The snow leopard is listed in CITES Appendix I and steps have been taken to limit the pelt trade. In India and Nepal national parks have been established; an effort has been made to rehabilitate habitat, protect prey species and educate local populations. The Zoo participates in the Species Survival Plan (SSP) for this species.

WHAT SHOULD BE DONE?

Further study to determine the snow leopard's current and past status is needed; the causes for concern should be determined for each region. Existing measures to protect the leopard should be evaluated and improved. Ecologically sound economic development for local people will help the snow leopard. A viable captive population also needs to be established and cooperation and consensus fostered among the countries involved.

WHITE-CHEEKED GIBBON

STATUS: ENDANGERED

LOCATION/HABITAT

This primate is found in the rain and monsoon forests of Laos, Vietnam and southern China.

WHY ENDANGERED?

The forest habitat has been rapidly destroyed by logging, rubber farming and in the recent wars in southeast Asia. The rapidly expanding Asian population kills this ape for food, medicine (the Chinese consider the gibbon as a cure for epilepsy) and captures it as a pet sold for profit. There is absolutely no protection for the gibbon in Laos and Vietnam.

WHAT IS BEING DONE?

The international CITES treaty regulates trade of the white-cheeked gibbon. Protection of this primate is a top priority in China. The Chinese have established protected reserves and have passed strict laws preventing the export of the gibbon.

WHAT SHOULD BE DONE?

Protected parks and reserves should be established in Indochina. Stronger laws should be passed to prevent hunting of the gibbon and to protect the habitat. More information should be collected about the gibbon population and how it interacts with its habitat. Long term breeding programs should be established that will eventually release gibbons back into a protected wild habitat. The citizens of the Asian countries with gibbon habitat should be introduced to conservation measures that they can realistically accomplish.

The Zoo and Endangered Animals

As managers of captive breeding programs for endangered animals and as educators about animals and their habitats, zoos play an important role in saving endangered species. However, space is limited on the modern ark, the zoo. Zoos are not the keys to long-term animal survival. You and I are when we undertake steps to protect threatened habitats such as tropical rainforests and native northwest forests.

What is the Role of the Modern Zoo?

No longer is the primary goal of a zoo to offer light entertainment to the public. Since the mid 1960's, zoos, botanical gardens and research centers have become custodians for the progeny, the next generations, of some plants and animals no longer able to survive in the wild. The focal point of a zoo conservation program is a controlled long term captive breeding program that can supply animals and plants for recovered habitats. In North America, about 150 zoos including Washington Park Zoo, participate in such breeding programs.

Long-Term Planning

Zoos and Aquariums accredited by the American Association of Zoological Parks and Aquariums (AAZPA*) participate in a long term captive breeding program, the Species Survival Plan (SSP*), for selected endangered species. The strategy uses knowledge of social and behavioral needs of individuals and complex scientific calculations to pre-plan an animal's family tree and so provide for the genetic needs of its species. It is important to remember that the end goal of managing captive populations is to return to a wild habitat, representatives that are as similar in behavior and genetics as possible to their wild-born ancestors.

Breeding Programs

The basis of captive animal breeding programs is the studbook that keeps records on and traces the ancestry of each animal. Such records have been widely used by the livestock industry but only comparatively recently by breeders of wild animals. Wild animals such as the Asian wild horse, Przewalski's horse, bred in the 1920's without attention to lineage, developed problems associated with inbreeding: increased mortality of the young and skeletal deformities. Today's breeding programs plan matings, arranged with "the care of royal marriages," and monitor locations of animals throughout their lifetime. Record-keeping begins at birth for zoo-born animals. Institutions cooperate in bringing together "good" matches between animals that may live on different continents. Today more than 80 percent of mammals displayed in North American zoos are captive born and 50 percent are second generation captives, that is, born from captive parents.

Studbooks

At this time, close to 100 studbooks are kept primarily in Europe and North America: 45 are maintained by North American institutions, 49 by European and 4 in other places. International studbooks are coordinated

* Refer to *Alphabet Soup* for more information

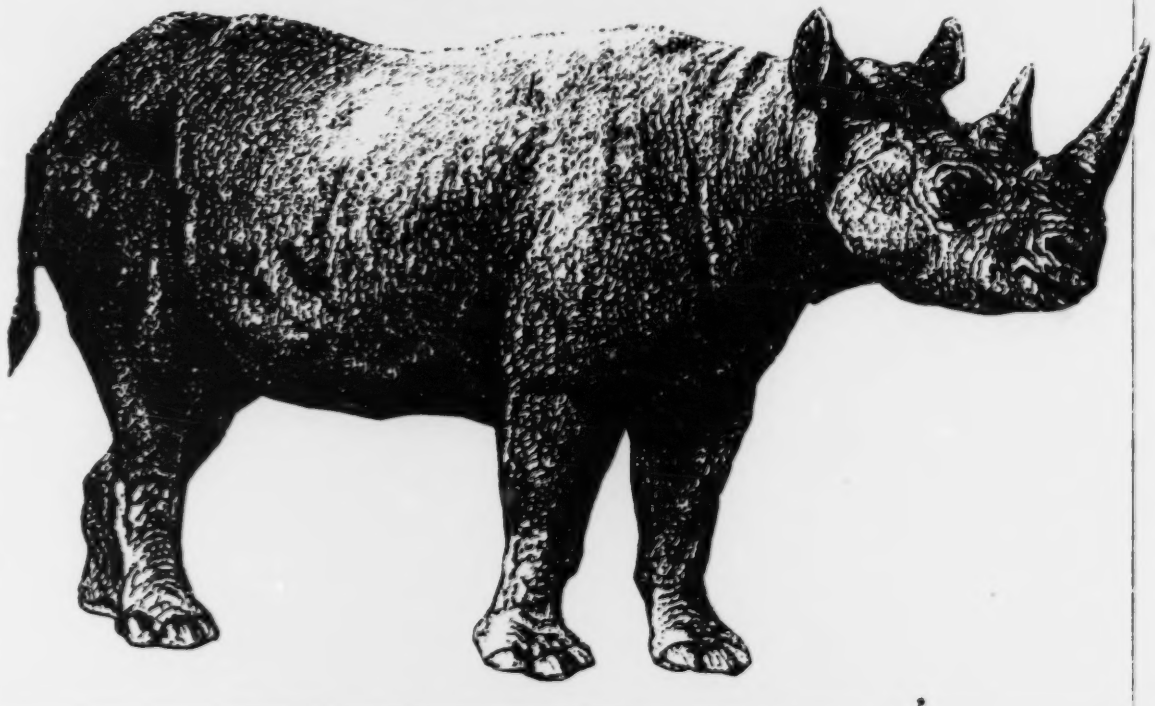
through the Zoological Society of London that also uses regional representatives to supply current population information. Washington Park Zoo keeps the North American studbook on Asian elephants and, in the near future, on the Francois' leaf-monkey. Traditionally, studbooks represented "charismatic megavertebrates," the large, "lovable" mammals such as tigers, elephants and chimpanzees familiar to zoo patrons. Frequently, animals such as these are "keystone" species, that is, they influence the species composition of their ecosystem to a greater extent than predicted by their low numbers in a habitat. This trend is changing as studbooks are developed for birds, reptiles and amphibians.

Challenges of Captive Breeding Programs

Some animals reproduce frequently and easily in captivity and others not at all. Lions, baboons and fallow deer have few problems reproducing in captivity. Gorillas, rhinoceros and cranes have difficulty. Species like the Douc langur from Vietnam, the monkey-eating eagles from the Philippines, and river otters have never reproduced in captivity. Problems are not easily identified: perhaps a zoo environment is not ideal but field studies, providing data of behavior and needs in the wild in order to design a close-to-the-wild "habitat," may not exist for many species. Without information about animal habits, zoos cannot tell what to change. It may happen, also, that pairs of rare animals are incompatible and cannot be housed together without fighting or moping.

The Old and the New

One obvious inconvenience of the studbook system is transportation. A breeding strategy may match an animal with a mate at the opposite end of the continent. However, developments in the storage of tissues that contain genetic material-pollen, seeds, sperm, eggs, zygotes and embryos and the technique of artificial insemination may increase the convenience of planned breeding. At the very least, the stress of transportation on live (and lively) animals will be reduced. In addition, a more varied gene pool can be maintained without the limitations of physical space.



Success Stories

Without captive breeding programs these species probably would have become extinct in the wild: the mouse deer, European bison, wild Asian (Przewalski's) horse, Nene goose from Hawaii, the Swinhoe pheasant and the golden lion tamarin. The final success of controlled breeding of wild animals is releasing them back into the wild. The golden lion tamarin of South America is an example of the loop completed. The National Zoo Conservation and Research Center in Washington, D.C. has had many captive births of golden lion tamarins since 1976. Some have been sent to the Rio de Janeiro Primate Center to be released in the wild habitat of Poco d'Anta Biological Reserve, one of the only two remaining areas of original tamarin habitat.

Some game parks and reserves, unconnected to zoos, also breed endangered animals. The profit motive has proven to be an important incentive to these captive breeding programs. Reserves now breed and manage some endangered animals as a source of food and other commercial products: the saiga antelope of Russia, the eland of the African savannah, the hippopotamus and the Siamese crocodile.

Limitations and the Future of the Programs

Both the original Ark of Noah and the modern zoo Ark offer only limited space for animals in need. One zoo director said, there are just not enough "staterooms" on the Ark. There is only space for a tiny fraction of the thousands of species

that are presently threatened. As more and more habitat is destroyed, more and more species will require refuge. The primary tenet of animal conservation, as previously mentioned, is that saving the habitat of species is the best way to save the species itself.

The study of captive animal management is in its infancy. Some of the same problems recognized in domestic animal husbandry exist in endangered species management: How should species be chosen for inclusion? How many founders, the initial wild-caught animals, are necessary to preserve genetic variation? What size of a population for any one species should be maintained in order to maintain variation in the gene pool? How or should exchanges between wild and captive populations occur? How should captive-bred individuals be reintroduced to a habitat containing wild individuals? And the final question, when can a Species Survival Plan be terminated?

Zoos Save Endangered Animals through Habitat Education

Zoos can offer only limited refuge to animals in need. For this reason, the primary role of the modern zoo is as a hub for conservation education. Natural-looking habitats for animals are built not only for an animal's comfort and to encourage breeding but to help visitors better understand the relation between wildlife and its habitat. Washington Park Zoo's Penguinarium is a good example of a "habitat" exhibit.

Zoo visitors who are informed about animals will hopefully become concerned about the disappearance of their natural habitat. If this concern can be translated to personal action, then the zoo's efforts are successful.

Protection for Endangered Animals Outside the Zoo

Institutions and government agencies in the United States and around the globe collect animal information and develop policies to protect animals and plants on the brink of extinction. Threats to the environment and its inhabitants are global and require international cooperation. Here is a brief summary of what is being done to protect animal habitat, to reduce trade in endangered animals and animal parts and to collect and manage data on captive animals.

INTERNATIONAL EFFORTS

CITES* Treaty

An international treaty of cooperation, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES, is an ambitious attempt to counter the increasing threat of global trade in wild plants and animals. In 1987, 30,000 species of animals and plants brought millions of dollars to traders. The CITES treaty does not attempt to prohibit trade but to regulate it which makes ratification of the treaty more appealing to member nations. At this time 95 nations have agreed to this treaty. Recently, Singapore, a notorious trading center for wildlife and wildlife products, refused to sell endangered plants and animals and joined CITES. As markets like this drop out, traders find it more and more difficult to find buyers.

CITES has been responsible for drastically reducing commerce in furs of large cats such as cheetahs and jaguars. It has also successfully brought the ivory trade under some control although destructive trade in rhinoceros horn is not yet reduced.

Wild and Zoo Animal Research and Data Management

Surveys of wild populations of animals and plants, especially in areas of encroaching human populations, are collected and made available in the Red Data Books of the International Union for the Conservation of Nature and Natural Resources (IUCN*). This information is used to determine how animals and plants are categorized for the CITES lists.

Zoos use a computerized record keeping system, called the International Species Inventory System (ISIS*) to keep track of their animals. Records are maintained on birds, mammals, reptiles and amphibians in 180 participating zoos, aquariums, private collections and research centers.

*Refer to *Alphabet Soup* for more details.

Habitat Protection:
Parks, Wildlife Refuges and Reserves

Many countries have set aside protected land for parks, wildlife refuges and other reserves. Although more than two million square miles exist globally as protected habitat, that is still only 3 percent of the total land area of the world. Scientists are discovering that many of these reserves are too small to support healthy populations of some animals. Isolated land segments may bring changes such as increased light, drier air and more predators to the habitat.

Habitat Restoration

Preserving natural habitat is more and more difficult as untouched lands shrink with expanding human population. Recent efforts in Costa Rica have begun to restore degraded cattle ranch land to its previous rainforest habitat components. Programs like this one are rare for several reasons. Returning land to its original form is difficult and expensive. In addition, expertise and technology in this field often does not exist or is limited. If the process of habitat restoration gains resources and trained staff, there might be hope in a few generations for the overgrazed rainforests of Central and South America.

Conservation Organizations

Many private organizations, dependent on grants and citizen donations, work to protect equally endangered habitat and inhabitants. The World Wildlife Fund (WWF), Greenpeace, the Sierra Club, the Nature Conservancy, Audubon Society, National Wildlife Federation and the Royal Society for the Protection of Birds are some of the international and national citizen groups that support a variety of conservation projects around the world. Important purposes of these organizations are to study ecosystems, habitat and individual species and to educate the public about threats to endangered species and about protection measures necessary. Addresses of these and local organizations are provided in the *Resources* section of the Teacher Information Packet.

NATIONAL AND REGIONAL EFFORTS

Federal Wildlife Laws

The Endangered Species Act* of 1973 gave the United States a far-reaching law for the protection of plant and animal species facing extinction. Primary responsibility to administer this act rests with the U.S. Fish and Wildlife Service.

The Marine Mammal Protection Act (1972), the Migratory Bird Treaty Act (1918) and the Eagle Protection Act (1940) protect specific groups of animals. The Lacey Act (1900), with strict penalties for violating protected species, is often used to prosecute commercial traffickers in animals, plants and their products.

Federal Wildlife Agencies

The United States Fish and Wildlife Service (USFWS*) of the U.S. Department of the Interior protects wildlife by listing threatened and endangered species (in conjunction with the CITES international lists), by listing critical habitat necessary for species survival and by outlining long term species recovery plans. In mid-1990, USFWS listed 329 mammals, 232 birds, 107 reptiles and 19 amphibians as endangered or threatened. For an update on this list, contact the USFWS at the address listed in the *Resources* section of the Teacher Information Packet.

The National Marine Fisheries Service in the U.S. Department of Commerce has authority comparable to the USFWS for the protection and conservation of most marine life.

State of Oregon Wildlife Law and Agency

In 1987, the Oregon Endangered Species Act was passed. Protection of threatened and endangered animals on state-owned land was assigned to the Oregon Department of Fish and Wildlife (ODFW). This agency provides the guidelines for listing an animal as threatened or endangered, conducts investigations of native wildlife species and develops conservation programs for listed animals. In June, 1990, there were seventeen endangered and twelve threatened species on the State's list. Mammals include several species of whales, the gray wolf, kit fox, sea otter and wolverine. Birds include the bald eagle, northern spotted owl and two types of falcons. For a complete list, contact this department at the address listed under *Resources*.

*Refer to *Alphabet Soup* for more details

What You Can Do that the Zoo Cannot

To Teachers...

The news from different fronts — research, media, literary and political — all communicate the same depressing message. The wild places and the wild creatures that live there are fast disappearing. But the news can be less depressing if we use it as a **call to individual action**. It is important to tell students that they do not have to fly down to Brazil in order to protect the tropical rainforests. They do not have to become conservation biologists in order to protect whales and elephants. Protection for animals and habitat starts in our homes, our schools and in our daily lives. The information below is geared to students. Please copy for each one. The classroom post-Zoo visit activity called *Be on the Animals' Team* uses this information to encourage personal solutions to the extinction crises facing wildlife and habitat.

For Students...

Read these pages because you care about wild animals and their homes.

What You Can Do that the Zoo Cannot

The zoo can teach you about endangered animals but the zoo cannot change the way you live. The zoo can show you about wild places but the zoo cannot save the wild places better than you. What does the way you live and saving wild places have to do with each other? The way you live may make some animals extinct because the way you live may destroy the places where wild animals live. What is it about the way we live, you ask?

The Bad News

GARBAGE: Well for one thing...garbage. Each one of us throws away about 3 1/2 pounds of garbage every day. That adds up to 1277 pounds every year for each person in the United States. All that stuff we throw away came from somewhere else and will go somewhere else. Where it came from may be the habitat of some endangered animals And after the ground is dug up to make aluminum for that can or after the trees are cut down to make paper, it's not the same place. The animals can't find enough food, water and shelter when all that is left is a huge open pit or tree stumps. Further, when your garbage goes to a "dump", a landfill, it takes over land that once was the home for a community of plants and animals.

POISONS: We take poisons for granted. We keep them around the house to spray bugs and weeds, to clean floors and bathrooms and then we dump them down the drain. But the spray you use kills more than the harmful bugs and the chemicals you dump down the drain go into the same lake, stream or river you swim, boat and fish in. That is what environmentalists mean when they say, "there is no away."

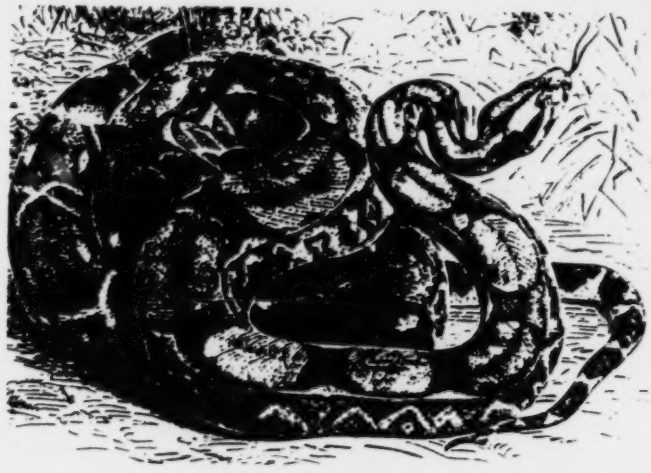
HABITAT GOODBYE: There is an easy-to-see connection between garbage, poisons and animals. Much of what we buy and then throw away came out of some animal's habitat. And that habitat didn't stay the same after it was plundered for its riches. Both the landfill and the river our poisons pour into are also animal habitat. When the habitat is destroyed or polluted, so are the animals who lived there.

BUYER BEWARE: There are laws that try to protect animals and plants that are in danger of extinction but the people who enforce the laws can't be everywhere. In one year, over 800,000 wild birds were brought into the United States and sold as pets. And the number is also enormous for exotic reptiles, like tropical snakes and lizards. There are still places that sell things made from endangered animals– ivory, tortoiseshell and fur. Between 1979 and 1987, Hong Kong imported 3900 tons of elephant ivory. More than 400,000 elephants died for their tusks.

The Good News

YOU CAN MAKE A DIFFERENCE: You may live half way around the world from the tropical rainforests but you are still connected by what you buy, how you eat and what you throw away. You don't have to hope that somebody somewhere saves the animals...saves their habitats. You are the somebody and you have to "just do it." We may be a large cause of the problem of endangered animals but we are also the solutions.

RECYCLE: In this decade, trees don't have to be cut down, ore doesn't have to be dug up and oil doesn't have to be pumped out of the ground in order to have paper, aluminum and fuel. We can recycle. You can save the lives of four trees by recycling your daily newspaper for one year. And trees in a forest are one of the most important animal habitats in the world. Glass, oil, aluminum and other metals, and plastics can all be recycled and so lessen the stress on animal habitats.



"JUST SAY NO" TO POISONS AND POLLUTION: There are ways to clean houses without toxic chemicals. There are places like hazardous waste dumps to get rid of oil, bug sprays and other toxic wastes without throwing them into the landfill. Products like baking soda can replace more harmful cleaning agents like oven cleaners and cleanser with chlorine. Read a book like *50 Simple Things Kids Can Do to Save the Earth* for suggestions of replacements for dangerous chemicals.

WHAT YOU BUY IS WHAT YOU SAVE: As we've mentioned before, we're connected to the rainforests, to the polar ice cap, to the deserts of the world and to the animals that live there. Everything has a price. Spending money makes you a consumer, a shopper. Learn to ask the right questions before you buy.

Pet stores sell exotic animals like rainforest parrots and imported snakes and lizards. Before you buy, ask some questions. *Where is this animal from? Was it caught in the wild?* For every parrot in a pet store, at least four others died at capture or from rough handling while being shipped thousands of miles. Don't add to the problem of removing wild-caught animals from their homes. Don't buy or collect wild animals.

Learn about the "hidden" costs of some common foods — tuna fish and fast food hamburger meat are two you could question. Much of the beef used in fast food hamburgers comes from places that were once rainforest but have been burned and destroyed to become range land for cattle. It takes 55 square feet of tropical forest to produce one hamburger. Unfortunately, the soil in the burned land is so poor that it will only support cattle for a few years. Then more rainforest must be burned for the business of beef. Some types of tuna, those usually in cans marked "light," are caught in giant nets that also destroy dolphins. In recent years more than 6.5 million dolphins have been killed in tuna nets.

TAKE ACTION: There are a lot of things you can stop doing in order to save animal habitats and animals. But there are also a lot of things you can start. Here's a short list to give you some ideas:

1. Construct an animal "habitat" to attract birds and animals. Plant trees and other vegetation. Build bird houses.

2. Learn as much about animals and where they live as you can. Watch nature programs, read books, join a local or national conservation organization. Ask your teacher for the list of organizations that came with this Zoo tour packet.

3. Adopt an endangered animal. Most zoos and the World Wildlife Fund would be happy to tell you how to do this.

4. Tell your friends and family how they can save animals. You may be just the right teacher.

5. Write letters to government representatives and organizations to let them know how you feel about actions they need to take to save endangered animals and their habitats.

Resources

General Reference Books and Articles

Bendiner, Robert. 1981. *The Fall of the Wild - The Rise of the Zoo*. E. P. Dutton, New York.

Ehrlich, Paul and Anne. 1981. *Extinction - The Causes and Consequences of the Disappearance of Species*. Random House, New York.

Day, David. 1981. *The Doomsday Book of Animals - A Natural History of Vanished Species*. The Viking Press, New York.
A beautifully illustrated and well-written book which charts 300 years of animal extinction from 1680 to the present.

Durrell, Lee. 1986. *State of the Ark*. Doubleday, New York.
An atlas which takes a complete look at the living planet including ecosystems, habitats and species; describes strategies for conservation and prospects for survival.

The EarthWorks Group. 1990. *50 Simple Things Kids Can Do to Save the Earth*. Andrews and McNeel, Kansas City.
A guide book to environmental action for children with lots of experiments, facts and fun things to do, a great resource for the classroom.

The EarthWorks Group. 1989. *50 Simple Things You Can Do to Save the Earth*. Earthworks Press, Berkeley, CA.
A guide book to environmental action for individuals with an emphasis on lifestyle changes and the cumulative impact of individual actions.

Hoage, R. J. 1982. *Animal Extinction What Everyone Should Know*. Proceedings of the first National Zoological Park Symposium for the Public.
This book takes a detailed look at all aspects of extinction from strategies for survival to the implications for humankind.

MacEachern, Diane. 1990. *Save Our Planet: 750 Everyday Ways You Can Help Clean Up the Earth*. Dell Publishing, New York.
A detailed guide to environmentally responsible living at home, at work, at school and in the community. Excellent resource lists of publications and organizations.

Myers, Norman. 1984. *Gaia, an Atlas of Planet Management*. Doubleday, New York.
A guidebook and atlas for managing the earth's resources for long term survival of humans and nature.

Nilsson, Greta. 1986. *Endangered Species Handbook*. Animal Welfare Institute. One copy is free to educators. Write Animal Welfare Institute, P. O. Box 2650, Washington D. C. 20007.

Threats to Biodiversity. 1989. Scientific American 261: 108-116.

Other Sources of Activities

Ranger Rick's Nature Scope. 1988. *Endangered Species: Wild & Rare*. National Wildlife Federation.
A excellent curriculum on endangered species with classroom and outdoor activities for grades K-2, 3-5 and 6-7. Good resource list and background information.

Project WILD
Western Regional Environmental Council
Salina Star Route
Boulder, CO 80302

An interdisciplinary, supplementary environmental and conservation education program emphasizing wildlife.

Audiovisual Materials

Places to look for films and videos of endangered species include:

Local county Educational Service Districts (ESD's)

Portland State Film Library

Public Libraries

OMSI Science Store video rental

Portland Public Schools (PPS) Educational Media
Look under the following subject heading for relevant materials:

ANIMALS-HABITATIONS

ECOLOGY

EXTINCT ANIMALS

RARE AND ENDANGERED SPECIES

WILDLIFE CONSERVATION

Also look under names of specific animals, for example, Wolves, Elephants, etc.

Selected Titles from PPS Catalog

ANOTHER AFRICA: WILDLIFE AND PEOPLE IN CONFLICT Grades 6-12
A 25-minute videotape which explores the competition between farmers and wildlife in Kenya. 1986.

THE BIG CATS: ENDANGERED PREDATORS Grades 6-10
A 22- minute videotape which looks at the big cats in their natural environment and warns against the danger of extinction. Also includes information on captive breeding programs. 1978.

BRIGHTEST AFRICA Grades 6-10
This 30-minute videotape tours the Akeley Hall of African Mammals at the American Museum of Natural History. 1987.

ECOLOGY! WANTED ALIVE Grades 7-12
A 10-minute 16mm film showing the plight of endangered animals and the impact of pollution, biocides and hunting. 1973.

ENDANGERED ANIMALS: WILL THEY SURVIVE? Grades 7-12
A 24-minute film identifying the most endangered species and the human role in disturbing the natural balance. Highlights efforts to save endangered animals in the U. S. and Africa. 1976.

ENDANGERED SPECIES DATABASE Grades 6-12
Contains database files for Apple II+/e/c on all U. S. endangered mammals, extinct animals from 1600 to the present, and some of the most critically endangered species world wide. 1987.

KNOWZONE: WILDLIFE FOR SALE Grades 6-12
This 29-minute videotape explores the illegal trade in protected wildlife. Visits Singapore for a behind-the scenes look at this destructive, lucrative business. 1987.

SAVING OUR WILD ANIMALS Grades 2-5
A filmstrip and 2 cassettes which profile endangered animals and discuss strategies for protection. 1978.

TALES OF ENDANGERED WILDLIFE Grades 3-5
Six filmstrips and 6 cassettes which present stories about endangered animals in North America. Includes whooping crane, alligator, bighorn sheep, buffalo, bald eagle and gray wolf. 1976.

THREATENED SPECIES Grades 3-8
A kit with color slides, cassette and script. Profiles endangered species and describes human impact on wildlife. Produced by the Washington Park Zoo. 1977.

VANISHING ANIMALS OF NORTH AMERICA Grades 6-10
Five filmstrips and 5 cassettes that look at animals now extinct and ongoing efforts to preserve endangered species. 1975.

VANISHING FROM THE EARTH Grades 6-10
Three filmstrips and 3 cassettes which explore the issues of rare and endangered animals and efforts to protect them. 1986.

Other Titles to Look for:

National Geographic Videos:
- Africa's Stolen River
- African Wildlife
- Among the Wild Chimpanzees
- Land of the Tiger
- Man-Eaters of India
- Polar Bear Alert
- Rainforest
- The Rhino War
- Save the Panda
- Search for the Great Apes
- The Wilds of Madagascar

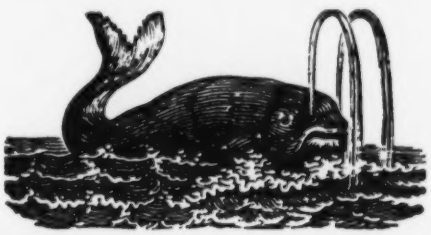
Life on Earth videos

Organizations

This is not a complete list nor an endorsement of specific environmental and wildlife conservation organizations; many other groups are actively working to protect the Earth.

The Audubon Society
5151 NW Cornell Road
Portland, Oregon 97210
(503) 292-6855

The oldest conservation group in America, the Audubon Society works to protect wildlife and wildlife habitat.



Greenpeace
1611 Connecticut Avenue, NW
Washington, D. C. 20070
(202) 462-1177

An environmental and wildlife conservation organization which focuses on ocean ecology.

National Wildlife Federation
1412 Sixteenth Street, NW
Washington, D. C. 20036-2266

An organization which promotes conservation education for the wise use of natural resources and protection of the global environment.

The Nature Conservancy
1234 NW 25th
Portland, OR 97210
(503) 228-9561

The Nature Conservancy seeks to protect the Earth's rare plants, animals and natural communities by acquiring land through purchase, donation and legislation.

Oregon Department of Fish and Wildlife
P. O. Box 59
Portland, Oregon 97207

Maintains a list of Oregon threatened and endangered species and produces a newsletter called Wild Flyer, a publication of the Nongame and Watchable Wildlife Program.

Tropical Forests Forever
P. O. Box 69583
Portland, Oregon 97201
(503) 285-6797

This local group is "dedicated to the conservation and sustainable development of tropical forests through increasing awareness, information, education and action." They meet regularly and produce a bimonthly newsletter.

Sierra Club
730 Polk Street
San Francisco, California 94109
(415) 776-2211

The Sierra Club uses legislative, legal, administrative and electoral means to promote conservation. Recent projects include the Arctic wildlife refuge, toxic waste regulations and global warming.

World Wildlife Fund
1319 Eighteenth Street, NW
Washington, D. C. 20036
(202) 293-4800

A private international organization which seeks to protect wildlife and wild lands especially rainforests.

The Xerces Society
10 SW Ash Street
Portland, Oregon 97204
(503) 222-2788

The Xerces Society is a national organization dedicated to the conservation of invertebrates (insects and other creatures without backbones). They put out a newsletter and have publications for sale. Much of their literature is about endangered butterflies.

Glossary

Acid Rain
Rain that forms from the reaction of pollutants such as sulfur and nitrogen compounds with water vapor in the atmosphere. The resulting acidic vapor can damage forests, aquatic organisms, crops, buildings and other things.

Adaptation
A behavior, physical feature, or other characteristic that helps an animal or plant survive and make the most of its habitat. For example, the white fur of a polar bear keeps the animal hidden in its Arctic habitat.

Biocide
Any toxic substance used to reduce vegetation (herbicide), fungi (fungicide), arthropods (pesticide or insecticide) or to eliminate other forms of life. Biocides are usually non-discriminatory in that they eliminate all types of that form of life, both "beneficial" and "non-beneficial."

Biome
One of the life zones into which the Earth's land surface can be divided. Each is characterized by specific vegetation adapted to a particular climate.

Carnivore
An animal (or sometimes plant) that feeds on animals.

Conservation
The protection and management of animals, plants and habitats.

Deciduous
Referring to trees, those that annually shed their leaves.

Ecology
Interrelationships of living things to one another and to their environment or the study of these relationships.

Ecosystem
The interacting system of a biological community and its non-living environment.

Endangered
Animals or plants whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are in immediate danger of extinction.

Environment
All the external physical, chemical and biological factors to which an organism is subjected.

Extinction
The dying out of plant or animal species and subsequent disappearance from the Earth except possibly in the fossil record.

Decomposer
An organism that lives by breaking down dead organisms and releasing minerals into the environment.

Food Chain
A chain of living organisms through which energy is passed by one organism feeding on another.

Food Pyramid
A model showing the relative mass of producers, herbivores and carnivores necessary to sustain the next mass higher in the pyramid (and thus less in numbers).

Food Web
A combination of food chains which connects all the living things within an ecosystem.

Habitat
Area where an animal or plant lives and finds nutrients, water, shelter and living space.

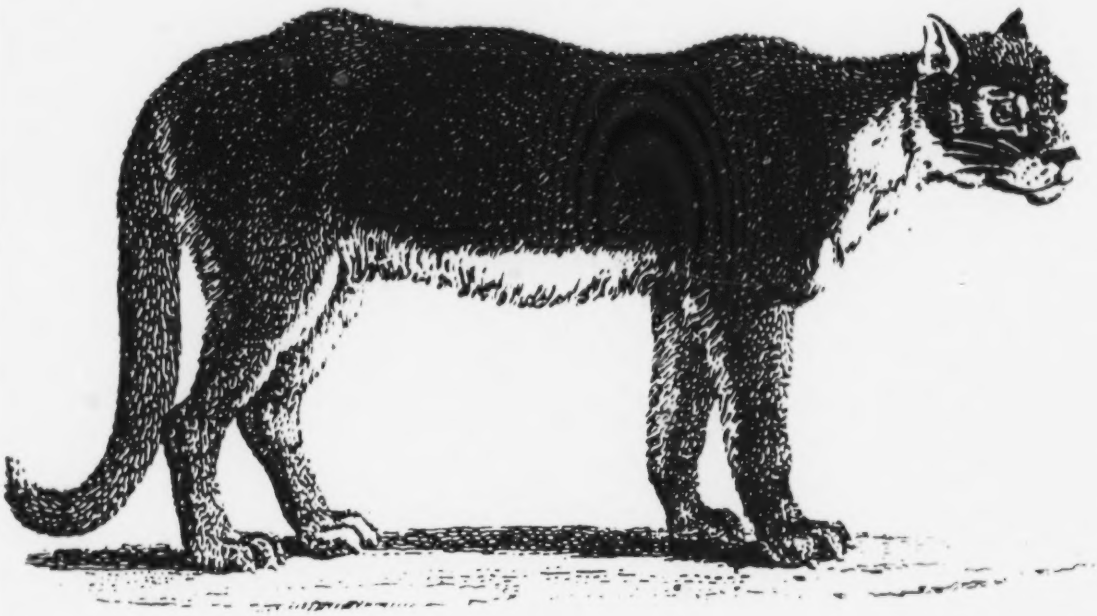
Herbivore
An animal that feeds on plants.

Omnivore
An animal which eats both plant and animal materials.

Poach
To hunt, kill or collect a plant or animal illegally.

Predator
An animal that preys on other animals for food.

Prey
An animal hunted or killed for food by another animal.



Producer
Green plants which are able to manufacture food from non-living substances.

Range
The area in which an animal travels in the scope of feeding and other normal activities.

Rare
Animals with small world populations that are not at present endangered or vulnerable, but are at risk. These animals are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

Taxonomic
Relating to the study of the orderly classification of plants and animals according to their presumed natural relationships.

Threatened
An organism that is believed likely to become endangered because the size of its population is decreasing.

Alphabet Soup

Glossary of Animal Breeding and Information Programs, Agencies and Laws

AAZPA

The American Association of Zoological Parks and Aquariums (AAZP) is a professional organization for zoos and similar facilities. The association provides ethical guidelines and coordinates the conservation efforts of zoos in North America.

CITES

The Convention of International Trade in Endangered Species of Wild Fauna and Flora treaty (CITES) has been signed by the United States and about 95 other nations. CITES uses a relatively simple system of import and export permits to regulate animals and plants listed on one of three appendices. Appendix I, those most in need of protection, cannot be traded for commercial purposes at all. Examples of species on this appendix include all apes, lemurs, the giant panda, the great whales, giant salamanders and some orchids and cacti. Appendix II species, which might become endangered if trade is not regulated, include species, such as monkeys, cats, porpoises, birds of prey, crocodiles and orchids. Trade in species on this list is controlled by permits issued by the exporting country. Appendix III species do not have to meet the more rigorous criteria for listing on Appendices I and II. This last appendix enables a country, concerned about the status of a species occurring within its borders, to enlist the support of other countries in enforcing domestic conservation laws.

Commentators on CITES have noted that one reason so many nations have agreed to this treaty is that it does not come down squarely on the side of either trade or protection. However, as more habitat is threatened from encroaching human population and poverty, it has become increasingly difficult to maintain the delicate balance between trade and preservation.

ISIS

International Species Inventory System (ISIS) is a computerized record keeping system for zoo animals. It is housed at the Minnesota Zoo but maintains records on birds, mammals, reptiles and amphibians at 180 participating zoos, aquariums, private collections and research centers in the U.S., Canada, Europe, South America and New Zealand. ISIS provides complete information on the collections at member zoos. Species in each collection, numbers and genealogy of individuals, breeding histories and ages are all available. This information makes it possible for zoos to manage their collections more efficiently.

IUCN

The International Union for the Conservation of Nature and Natural Resources (IUCN) or World Conservation Union (WCU) based in Switzerland is active in over 120 countries around the globe. Members include government agencies, some of the more famous private conservation organizations, such as the World Wildlife Fund and the Sierra Club, and scientific and educational institutions.

In partnership with several United Nations organizations and the World Wildlife Fund, IUCN published the World Conservation Strategy. This important conservation document connects conservation efforts to the needs of humanity by the theme of sustainable development. This type of development caters to human needs without depleting renewable resources so that the future can be secured.

The Red Data Books of IUCN collect scientifically based data about species and ecosystems. This information is used to assess the severity of different problems and determine options for solutions based on sustainability which is appropriate to the local setting.

ODFW

Within the Nongame Wildlife Program of the Oregon Department of Fish and Wildlife (ODFW) is a program that addresses the needs of threatened and endangered animals. Oregon's Threatened and Endangered Species Program, established in 1989, was preceded by actions emerging out of the 1987 Oregon Endangered Species Act. The Program has established a watchlist of almost 100 species that face declining numbers or threatened habitat. This list is in addition to the 29 mammals, birds, reptiles, amphibians and fish currently listed

as threatened and endangered.

The Nongame Wildlife Program also works to protect and improve habitat, to increase knowledge of nongame species, to help sick and injured animals and to provide public information to Oregon citizens. To keep current with new developments, subscribe to their publication called "Wild Flyer."

SSP

A Species Survival Plan (SSP) is developed by AAZPA member institutions to conduct a captive breeding program. Efforts are concentrated on those species in the most danger and which have the best potential for captive breeding. Species in this breeding program are maintained in the hope that sometime in the future their chances of survival in the wild will improve. Chimpanzees, Siberian tigers, red pandas, ruffed lemurs and slender snouted crocodiles are examples of species now being managed cooperatively by several zoos with Species Survival Plans. Worldwide, between 50 and 60 species have an SSP. Species at the Washington Park Zoo participating in this plan are: the Humboldt penguin, the red-ruffed lemur, chimpanzee, orangutan, red panda, Asian elephant, snow leopard, black rhinoceros and Siberian tiger.

USFW

The United States Department of Fish and Wildlife (USFW), a branch of the United States Department of the Interior (USDI), works to conserve wildlife in three ways. Its considerable authority is based on the Endangered Species Act of 1973.

LISTING

Through rule-making procedures, species are added or deleted from the list of threatened and endangered species. Animals and plants which qualify for inclusion on the list are classified as protected and cannot be harmed and pursued, hunted, traded or transported in interstate or foreign commerce without special permission.

CRITICAL HABITAT

The Act also calls for the conservation of "critical habitat" necessary for the survival of threatened or endangered species. A procedure similar to that used for listing species is used to list critical habitats. The two listing procedures often parallel each other since the survival of a species is dependent upon the existence of suitable habitat.

RECOVERY

Plans to restore threatened populations to the point where they are no longer in danger of extinction are another part of the Fish and Wildlife Service's effort. Acquisition of land, research, captive breeding and special management techniques may be included in a species recovery plan.

11

MIDDLE SCHOOL
STUDENT ACTIVITY PACKET

THREATENED AND ENDANGERED SPECIES

Most of the activities in this packet are based on a field trip to the Zoo. At the Zoo, students are instructed to collect and record data from observations of animals and exhibits. Zoo-collected data are intended for later analysis and follow-up discussion in the classroom. Build in classroom time in order to complete the activities. Collecting data that "goes nowhere" does not encourage careful observations and understanding of the underlying issues of threatened and endangered animals and habitats.

Copy the charts in the Zoo activities for your students before their field trip. A few activities suggest some classroom preparation in order to collect data at the Zoo. Classroom preparation is indicated in the "Directions." Take a few minutes to review the broad range of included activities. The topic of threatened and endangered animals is multi-disciplinary; you can use the Tour Packet to teach not only science and math but social studies, art, language arts and other subjects.

A few of the activities are designed for classroom use either before or after your Zoo visit. We hope that you will take some class time to use these.

On the first page of the teacher's guide for each activity, you will find a list of the specific Oregon Comprehensive Curriculum Goals addressed by that activity.

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You at the Zoo

The Zoo is a rich and stimulating environment in which students easily can be distracted. Research in zoos and museums indicates that children often are overwhelmed by unfamiliar sights and sounds as well as by what they perceive to be "freedom" from a typical, more structured classroom setting. When this happens, their attention becomes focused on the novelty of the experience and little learning about the actual exhibits takes place.

Help your students have an enjoyable and productive visit and make your own job easier by preparing your class for their visit. Discuss the following:

1. The Physical Environment

The Zoo is often crowded with other classes and groups of active, noisy children. Exhibits that are indoors sound noisier because of the confined space. Besides live animals on display, each exhibit has stimulating pictures, signs and perhaps interactive components. Your students will find out more if they look at the components that complement the animal displays. Many of the activities in this Student Activity Packet can be completed both by viewing the animals and by reading the labels and signs. Games at some exhibits are very popular with visitors and are utilized best by small groups. Most live animal viewing areas are adequate for large groups, but small enclosures such as dens and aquariums are utilized best by one to six students at a time.

2. Student Accountability

Talk to your students about appropriate behavior for a learning field experience. Although most students know how to behave, they sometimes forget in the excitement of the moment. The on-site activities of the packet direct students to collect blocks of data that are to be interpreted at a later date. Don't collect data just to collect data. For data collection and later interpretation to be successful, students must be alert, prepared and stay on task. Discuss with them what kinds of information they are looking for and where to find it. A Teacher's Guide accompanies each data sheet and will provide you with this information. Remind students that making observations and collecting data is time consuming. They can complete most of the activities if they try to limit their distractions. Keep your expectations high and your students will meet them.

3. Your Chaperones Can Help

The Zoo requires one chaperone for every five students. Use their assistance. Invite your chaperones to read the background information and teacher's guide for Zoo activities and to familiarize themselves with the widespread locations in the Zoo for endangered animals. Zoo maps are available on site. Encourage your assistants to ask leading questions in order to focus students on the observations required.

4. Students and Endangered Animals

Remind students of the rarity of the animals they will study in this packet. Let us remind one another that:

"Animals connect people to the whole of life. It will be a poorer world if the time ever comes when children have to ask...

...what was a snow leopard?
a Humboldt penguin?
a chimpanzee?
a black rhinoceros?
a Siberian tiger?
a gray wolf?"*

*paraphrased from a quote by Frank W. Lane

CLASSROOM ACTIVITY

Make Habitat a Habit!

Directions

1. Read this definition of a habitat

The natural area where an animal or plant lives and finds everything it needs to stay alive and keep healthy.

2. What is "everything" an animal or plant needs? Make a list below of the same "things" three different habitats provide for the animals and plants that live there. Compare a desert, tide pool or Arctic tundra to a temperate forest like one in the Oregon Cascade Mountains.

3. Your teacher has divided up the class into smaller groups. With your group, choose one of the following animals for which to design a habitat. Make a list of the specific requirements for your chosen animal. You may need to look up information in an encyclopedia or other books with animal facts.

- Ants
- Crickets
- Caterpillars
- Ducks or other birds
- Pond life (water bugs, etc.)
- Earthworms
- Ladybugs
- Slugs
- Spiders
- Sow bugs
- Squirrels
- Moles
- Tadpoles
- Mice

4. Make a habitat "blueprint." The blueprint should be an actual plan that other groups in your class can follow to put together a "habitat" for the animal your group chose. Indicate the size of the "habitat" and placement of habitat essentials (plants, water, etc.) This habitat can be an inside "habitat" to house animals in the classroom or an outside "habitat" to attract and nurture local creatures.

FOR EXAMPLE: You may have chosen a spider and decide to build a classroom "terrarium" for it. Or you may decide to attract birds to a space on the schoolgrounds that you want to turn into a "habitat."

Make Habitat a Habit!

CLASSROOM ACTIVITY

1.0 Concepts: 1.5, 1.11, 1.14, 1.23
2.0 Processes: 2.1, 2.2, 2.3, 2.5, 2.10, 2.15
3.0 Manipulative Skills: 3.1, 3.2 (A Step Further)
4.0 Interests: 4.3

Objectives

- Make students aware of the complicated interrelationships of a habitat.
- Design and/or set up a "habitat" for some common invertebrates, local species of birds or small mammals.
- Encourage understanding of the differences between an artificial zoo or classroom "habitat" and a natural habitat.
- Encourage understanding of the uniqueness and irreplaceability of natural habitats; habitats need to be protected since they can't be replicated.

Directions

1. Have your students read the simple definition of a habitat at the top of their activity page. Emphasize that a natural habitat is self-sustaining.

2. After students spend a few minutes making individual lists of the components of three habitats, let them share these with the rest of the class and brainstorm others.

3. Divide the class into several groups. Have each group choose a common local creature from the list given to students for which to design a habitat. The end product is a drawing or a blueprint of this inside cage home or specially designated outdoors area that will provide an artificial "habitat" for the chosen animal.

Emphasize that a blueprint needs to be definite. After all, a carpenter can't build a house from a vague, casually drawn picture of the final structure.

You may want to recommend that all groups design an outside habitat. In this case, take a "mini" field trip around the school grounds. Groups pick out a site, take measurements and soil samples and note other characteristics to be considered in their habitat design.

4. Have groups present their habitat design to the rest of the class.

5. Class discussion:

a. What are some differences between their design or a zoo-designed habitat and a natural one? (Two important differences are that the wild habitat is self-sustaining and has relationships among inhabitants that may be missed in an artificial environment.)

b. Initiate discussion on the complexity of artificial habitat design. What might be missing? How can you tell something is missing?

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A Step Further

1. Beyond Habitat:

a. Introduce terminology for systems larger than a habitat: ecosystem and biome (vegetation zone). Use the activity *Where in the World* to show different zones around the world.

b. Have student groups "adopt" a zone. The end product is a scrapbook showing types of conditions that make units, such as a tropical rainforest or savannah distinctive.

2. Backyard or Schoolyard Habitat

If you want a constructive longer term project that is beneficial to the wildlife in your area, consider this:

a. The National Wildlife Federation will help you set up a "wild" habitat in your backyard or schoolyard. For information and a list of books about this Wildlife Habitat Program, write to:

National Wildlife Federation
Backyard Wildlife Habitat Program
1412 16th St. NW
Washington, D.C. 20036

Once your class makes an actual plan for their own backyard or schoolyard area, the National Wildlife Federation will review it and make recommendations to certify the area as an official Backyard Wildlife Habitat for the fee of $5.00.

b. Local Agencies Have Plans for Bird Shelters.

Portland's Audubon Society and the Oregon Department of Fish and Wildlife will send you plans of different bird house designs and nest specifications. Many can be made from recycled materials such as milk cartons. Discuss how bird houses are designed differently to attract and shelter birds with different adaptations.

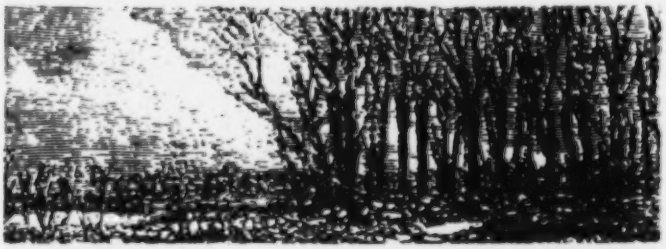
Habitat and Endangered Species

Habitat **— the natural area where an animal or plant lives and finds everything it needs to stay alive and keep healthy.**

Animals in the wild have habitat needs similar to humans. Both wildlife and human animals require food, water, shelter and space. The arrangement of these four factors constitutes a habitat. Habitats vary in general physical conditions, such as rainfall, temperature and the ratio of daylight to darkness and in more specific components. However, all share one feature. Wild habitats are self-sustaining.

To compare habitats, it is often helpful to look at a list of particulars:

- water
- food
- shelter
  - — to play
  - — to rear young
  - — to provide cover
- air
- type and amount of vegetation
- temperature
- general or micro climate conditions
- alternating seasons
- light and dark periods
- altitude
- amount of space



Zoo "Habitat"

Strictly speaking, the home developed in the Zoo or in the classroom for the comfort of captive animals is not a habitat. The captive wildlife cannot find enough food or water without continual human intervention. Current zoological trends design zoo homes that simulate the wild habitat of the animal(s) in residence. Similarity in physical appearance between natural and Zoo habitat may be primarily for the benefit of visitors. Some of the visible appearance, of course, also contributes to the animals' well being. However, other factors not as easily observed are more important.

The Penguinarium was designed to look like the offshore Pacific islands near Peru. Rocks and wave action simulate the wild habitat. But what is more important to encouraging penguin breeding are environmental controls such as air temperature (kept to about 18 degrees Celsius), air quality (filtered), cool untreated, filtered city water (13 degrees Celsius), dehumidifiers holding the relative humidity to 38 percent, ultraviolet light to kill microorganisms, a variety of porous and resilient land surfaces and enough nesting boxes to induce squabbling which appears to stimulate mating hormones.

The Zoo home that visitors see is often only part of the design for an animal. There are "behind-the-scenes" holding and feeding areas accessible only to zoo keepers that contribute to the animals' well-being.

Habitat and Endangerment

The key to saving endangered species is not to provide a simulated "habitat" in the Zoo but to find ways to conserve the wild habitat. Increasing human population with its need for food, water and shelter is destroying wildlife habitat at an alarming rate. Since most animals are adapted to a specific habitat, they also are destroyed. Reconciling human needs with animal habitat needs is a primary goal of conservationists who promote sustainable development. For example, sustainable development in the tropical rainforests would consider ecological and long term relationships along with social and economic needs of the human population.

Caught in the Web

CLASSROOM ACTIVITY

1.0 Concepts: 1.1, 1.3, 1.6, 1.11, 1.12, 1.14
2.0 Processes: 2.5
4.0 Interests: 4.3
5.0 Values: 5.6

Objectives

- Make students aware of the connection of plants and animals to each other in a food web.
- Demonstrate how an impact on one member of a web impacts all members and their connections.

Directions

1. Gather the string or yarn and stiff paper for name tags.

2. Write each name on the following list of Borneo rainforest food web components on paper. Throw the names into a box.

ENERGY SOURCE
Sun

BIRDS
Crested wood partridge
Rhinoceros hornbill

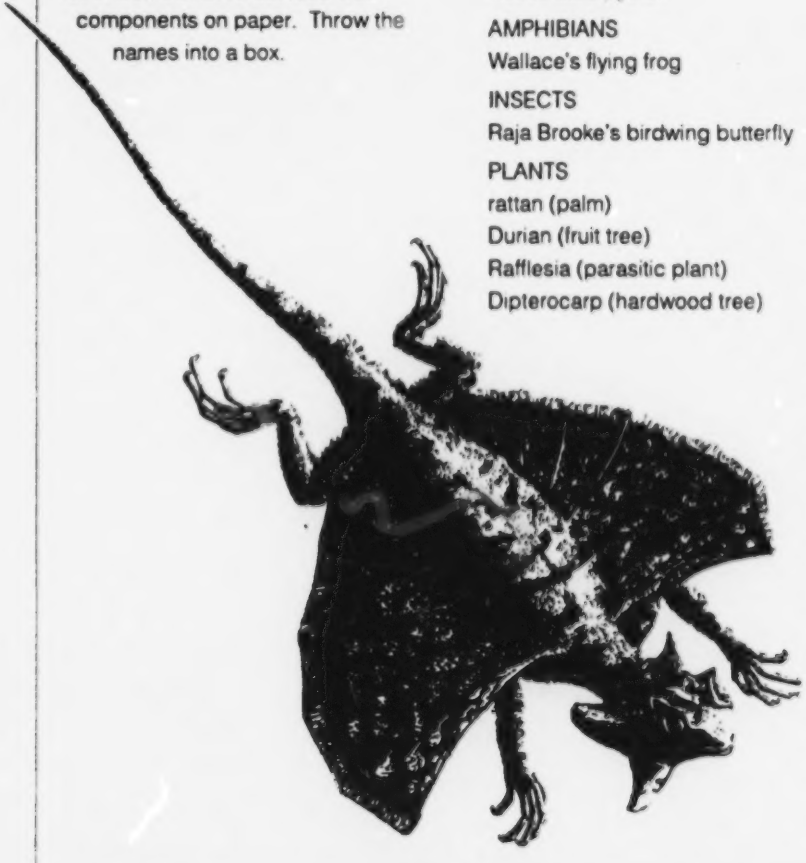
MAMMALS
Bearded pig
Bornean gibbon
Orangutan
Clouded leopard
Malay civet
Slow loris
People

REPTILES
Flying draco lizard
Reticulated python

AMPHIBIANS
Wallace's flying frog

INSECTS
Raja Brooke's birdwing butterfly

PLANTS
rattan (palm)
Durian (fruit tree)
Rafflesia (parasitic plant)
Dipterocarp (hardwood tree)



3. Each student randomly picks a name out of the box. This is the student's "job title" in the food web. Have students write their name/job title large enough to wear on the nametag attached with two strings.

4. WEBBING
This part can be done as a paper/pencil activity but more preferably as a group "hands-on" activity.

a. Form students into a circle. If the class is larger than 20, you might want to divide the class in half and do it twice.

b. Start with whatever food web component you choose, plant or animal.

c. Use yarn or string to physically connect the first 'unit" such as a tree to anything it depends on or that depends on it, such as parasitic ferns, other tropical plants, snakes, farmer/rancher etc.

d. Connect these end-members to other units in the group until all are related one way or another.

5. IMPACTS ON THE FOOD WEB
Impact the food web by cutting down trees, eliminating various types of plants and animals with a forest fire, or by some other means. Each time one member feels a string connection move, he/she must move or drop any other connected strings. After each impact, instruct students to notice which and how many other connections are "shaken" by the removal of that one member in the web.

Background Information

Read the accompanying information called *Food Webs and Food Pyramids* for graphic representations of the Borneo rainforest food web and others.

A Step Further

1. LIFE WEB

Add the non-living components to the food web to make a life web. Write these names on a different color of paper. Put all the names back into the box and have students draw again. Repeat theactivity, but this time include necessities such as soil, rain, air quality, carbon dioxide in air and others from the list below.

Some life web components

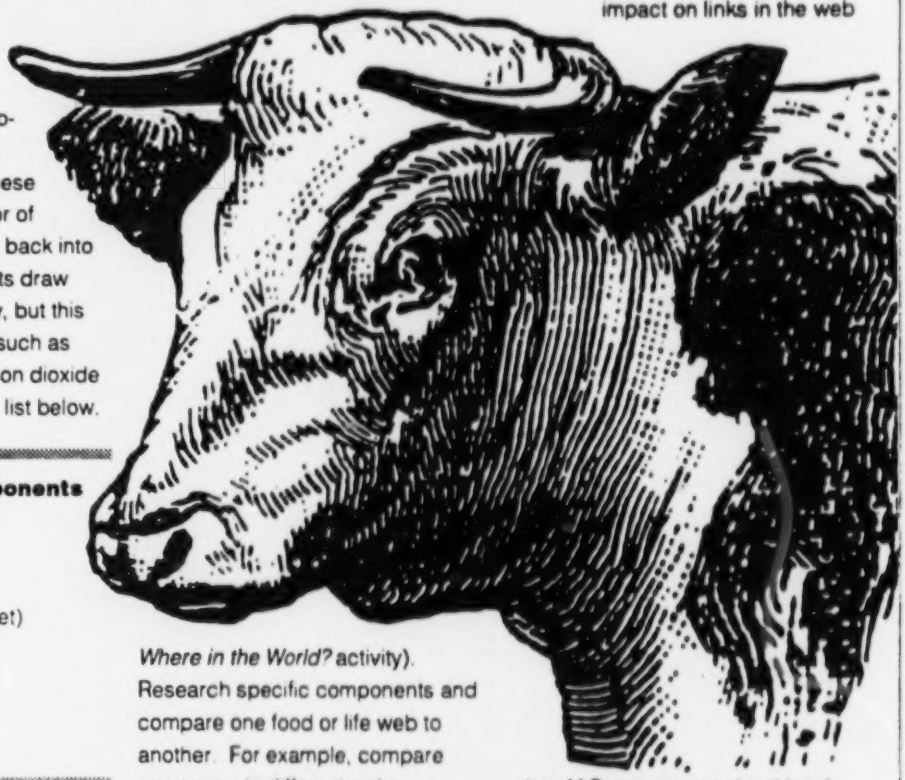
- rain
- carbon dioxide in air
- sunlight (visible and ultraviolet)
- soil
- wind
- temperature
- humidity

2. CASCADE FOREST ECOSYSTEM

If students already have some background on ecosystems and, in particular, those of the Cascade forests, have them generate a class list of components to use in the webbing activity. See the Zoo activity called: "What is wet and has trees?" for components of a temperate forest ecosystem.

3. OTHER ECOYSTEMS AND BIOMES

Students may be interested in developing webs of life or food webs for other ecosystems or biomes (see *Where in the World?* activity). Research specific components and compare one food or life web to another. For example, compare carnivores in different webs.



4. DINNER FOOD OR LIFE WEB

Have students construct a food or life web showing the connections for what they ate for dinner last night.

a. Components include food and themselves as omnivore.

b. Show connections. If you ate meat, you consumed at the top of the food chain. The herbivore or omnivore you had for your meal ate plants which depend on certain conditions of climate and soil.

—Impacts differ depending on where a product originates. For example, imported beef from cleared tropical rain forest has a different (and probably greater) impact on links in the web than U.S. grown rangeland beef.

c. Discuss impact of various diets (vegetarian and others) on global or local ecosystems.

5. GLOBAL ISSUES

If your class knows something about the relationship of trees, such as those in the rain forest to the amount of atmospheric carbon dioxide or precipitation, use the web to jump off into a discussion of global issues.

Check the *Resources* in the Teacher Information Packet.

Food Webs and Food Pyramids

Background Information

Any life form can be categorized by what it eats and what eats it. Six terms are used in this activity and in interpreting Zoo-based data collection: consumer, producer, herbivore, carnivore, omnivore

and decomposer. An elaboration of these terms can be found on the labels in the Cascades exhibit.

A producer makes its own food.

A consumer depends on other life forms for food.

An herbivore eats only plants.

An carnivore eats only meat.

An omnivore eats plants or meat.

A decomposer breaks down dead plant and animal matter into soil.

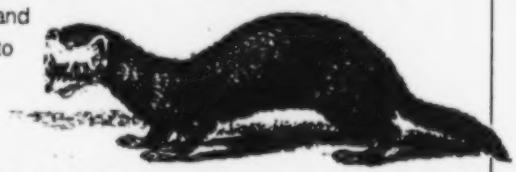
A food chain or web charts the flow of food and energy through a community or ecosystem. Plants use sunlight to combine atmospheric gases, soil nutrients and

water into energy. Animals eat the plants, carnivores prey on the plant eaters and other carnivores may prey on them. Decomposers, such as bacteria, fungi and some insects, break down and transform plant and animal matter into soil.

A web is extremely complicated in a woodland or coral reef teeming with life. But any web must be simplified in order to make a graphic representation. Here is a simplified group of components for a temperate forest food web as an alternative to the Borneo rainforest web in the activity.

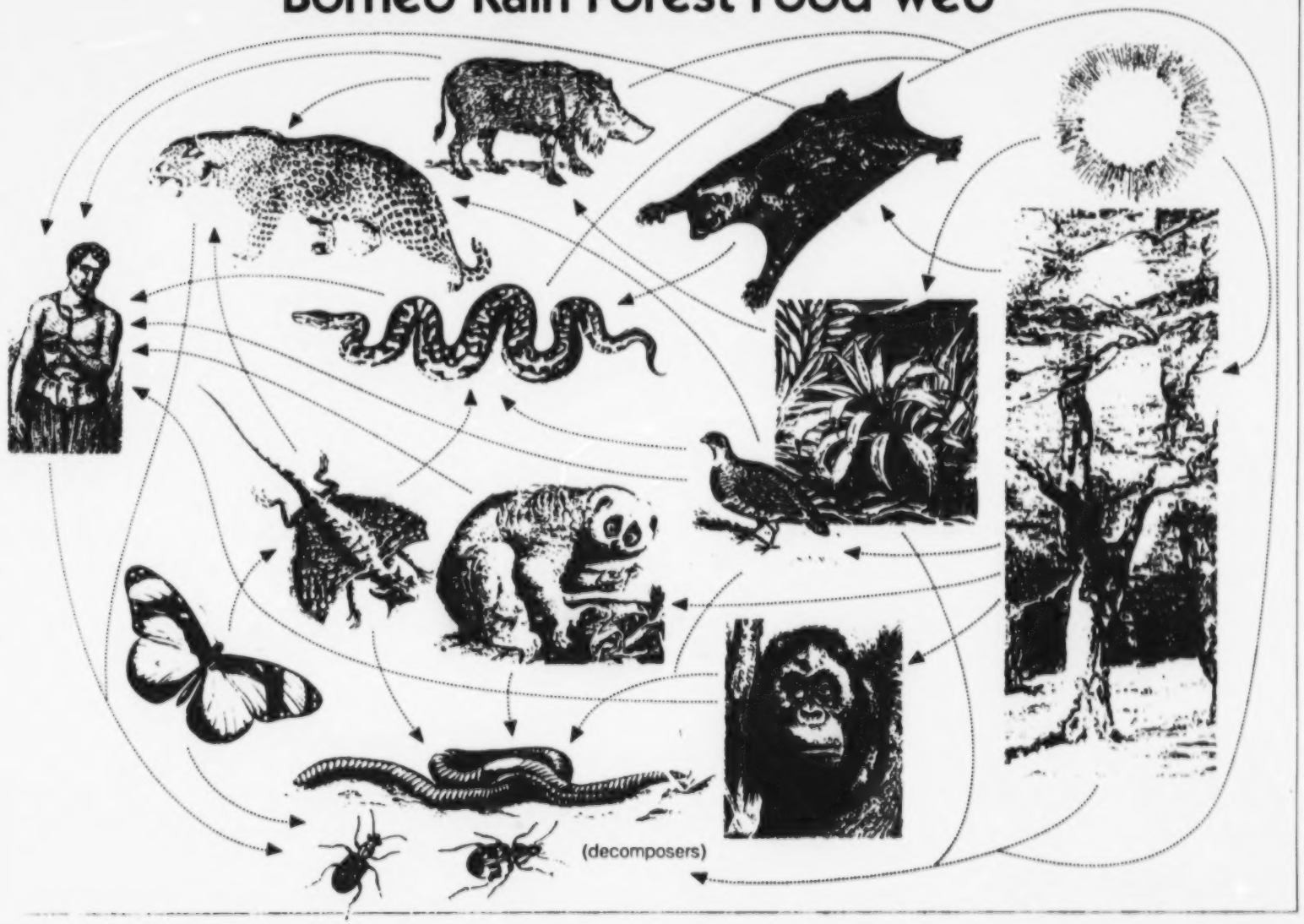
- Sun
- Human
- Partridge
- Caterpillar
- Thrush
- Fox
- Weasel
- Mole
- Mouse
- Rabbit
- Earthworm
- Snail
- Plants
- Soil (with beetles and other decomposers)

The food pyramid, similar to a food web, gives more quantifiable information. The bottom of a pyramid contains large numbers of energy-producing plants. Above them are a smaller number of herbivores, then a still smaller number of primary carnivores, then a smaller number of secondary carnivores, then the final consumers: omnivore or



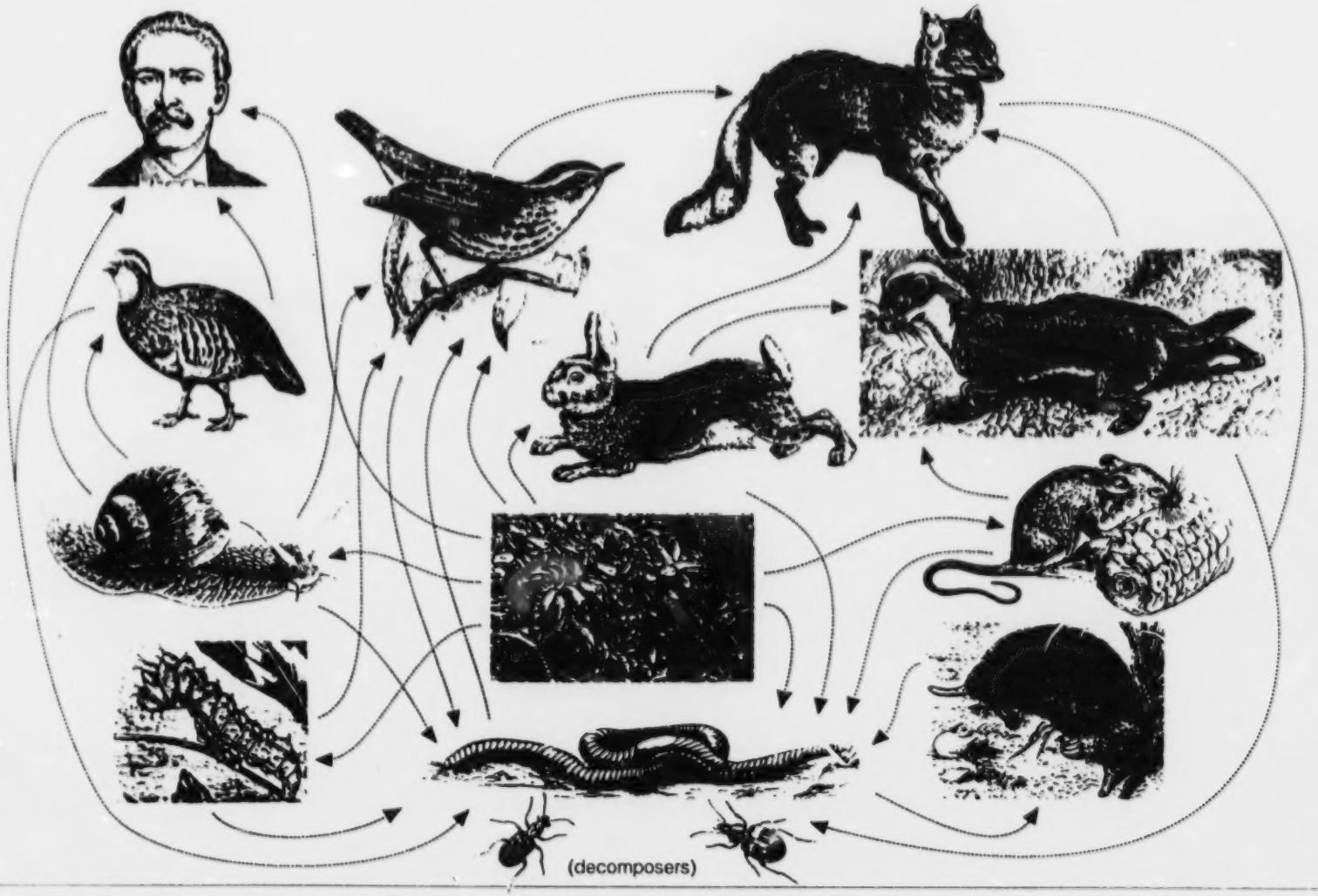
carnivore. Animals at the bottom of the pyramid are usually the smallest but most abundant members of the community while those at the top are the largest. One million out of the nearly one and one half million of identified animal species are insects. There are only about 4100 known species of mammals.

Borneo Rain Forest Food Web



CLASSROOM ACTIVITY

Cascade Forest Food Web



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"Going for the 21st Century –from the Brink of Extinction" First Annual Award

CLASSROOM ACTIVITY

1.0 Concepts: 1.1, 1.2, 1.6, 1.11
2.0 Processes: 2.15
4.0 Interests: 4.1, 4.4
5.0 Values: 5.2, 5.5
6.0 Interactions: 6.1, 6.2, 6.3, 6.4, 6.5

Objective

• Research and communicate by role-playing specific threats to endangered species and actions taken to lower their odds of extinction.

Goal

Final product: An awards ceremony in which students assume the role of an endangered animal that they have researched. Each student "species" will receive an award labeled: "Back from the Brink!"

Directions

1. Gather the following materials:

For animal research:
encyclopedia
Animal Profiles from Teacher Information Packet

For the awards:
colored paper, foil, string

2. Put the list of 30 animals from *Endangered/Threatened Animal Profiles* in the Teacher Information Packet on the blackboard. Have enough copies of the Profiles available for student research.

3. Instruct students to research an animal from this list. Based on research, students, assuming the role of their chosen animal, will write a short speech with these elements covered: 1.) why they (the species) are endangered or threatened, 2.) what steps have been taken to save themselves from extinction, and 3.) what more should be done to give themselves a greater chance at long term survival.

4. Make up the awards with your class. Cut out circles, one smaller than the other. Glue two pieces of ribbon between the two circles. Print the name of the species chosen and label: Back from the Brink!

5. Design the awards ceremony with your class. If they want a mini-Academy Awards type extravaganza, here is the opportunity.

6. Students, acting in the role of their chosen animals, make presentations at the "Back from the Brink" awards ceremony. You can be the "Master of Ceremonies." Each student relates his/her story based on research and accepts a ribbon.

Background Information

Mention to students that we do have models of efforts that have worked to bring some plants and animals away from the brink of extinction. Refer to *Protection of Endangered Animals Outside the Zoo* and *The Zoo and Endangered Animals* in the Teacher Information Packet.

Write to the World Wildlife Fund for more information about the animals on the list.

A Step Further

1. Discuss with the class some common elements in bringing different species back from extinction. Is there a lesson here that can be applied to other species equally threatened?

2. Comeback Stories

Students who are comfortable with researching information in periodicals can look for the success stories of some of the following plants and animals. All these animals were on the brink of extinction and have been protected with some success.

List of Plant and Animal Species that are Making a Comeback

alligator
American bison
Arabian oryx
bald eagle
golden eagle
brown pelican
cougar
eastern bluebird
elephant seal
elk
European bison
golden lion tamarin
gray whale
Hawaiian goose
Hawaiian monk seal
koala bear
masked bobwhite (bird)
musk ox
northern sea otter
osprey (bird)
peregrine falcon
polar bear
pronghorn antelope
saguaro cactus
snowy egret
trumpeter swan
vicuna
whimbrel (bird)
whooping crane
wild turkey
wood duck

Be on the Animals' Team . . . What You Can Do to Win

CLASSROOM ACTIVITY
(recommended post-Zoo)

1.0 Concepts: 1.6, 1.11
4.0 Interests: 4.1
5.0 Values: 5.6
6.0 Interactions: 6.1, 6.2, 6.4, 6.5

Objectives

- Make the connection that personal actions can reduce threats to endangered species and their habitats.
- Stimulate creative solutions to problems of endangered animals and habitats.

Goal

Final product: a "Trivia" type game with problem/solution cards which is played by teams of students.

Directions

1. Collect the following materials: paper, scissors, and stiff paper (cardstock).

2. Prepare game cards ahead of class:

a. Cut out 3" X 2" cards.

b. On side one write a problem or reason for endangerment. On side two write one or several of the given solutions. Lists are in "Background Information" section of this activity. Set these cards aside until "game time."

3. Take time with your class to look through the following references:

a. *Book: 50 Simple Things You can Do to Save the Earth.

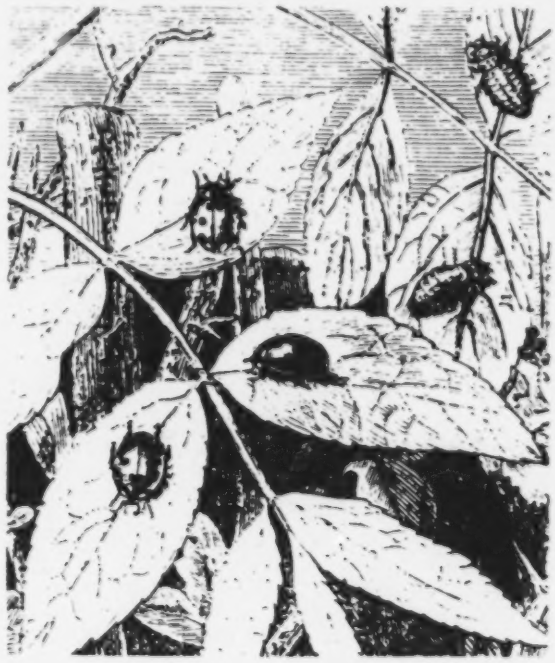
b. *Book: *50 Simple Things Kids can Do to Save the Earth.*

c. *Book: *Save Our Planet, 75 Everyday Ways You Can Help Clean Up the Earth.*

d. Teacher Information Packet: *What You Can Do that the Zoo Cannot*, written for students.

4. Brainstorm with your class different actions that each one of them and you can take to reduce or eliminate threats to endangered/threatened animals. Read to them some of the common reasons for animal and plant endangerment from the list in "Background Information." Write the problem and personal actions (solutions) on the board. You will need to generate enough problem/solution cards for the game to combine with the twenty-one cards you prepared earlier.

5. Have the class make two-sided cards (the same size as the ones you prepared) from the blackboard list. On one side write the reason for animal/plant endangerment. On the other write the personal solutions they came up with for that particular problem.



6. Combine the class prepared cards with yours in a box. Place all cards solution-side down. Tell the class that the solutions on your cards and theirs may overlap but any redundancy should only reinforce personal actions for all.

*See *Resources* list in the Teacher Information Packet.

7. "Game Time"

a. Divide the class into two teams. The object of this game is to come up with personal solutions to animal/plant endangerment and, as a team, to guess the name of an endangered animal. As each team member gives a "correct" answer, the team is given one letter in the name of an endangered or threatened animal (see examples in "Background Information."). The team must guess the animal as teams members give solutions. Whichever team guesses their animal first, "wins."

b. Rules: A member of Team A draws a card from the box and passes it to a Team B member to read the problem. Only the Team A member who drew the card may answer with a solution. Team B then draws a card and Team A tries to give a solution. Teams alternate questions and answers until one team wins.

The teacher is the final judge of the acceptability of solutions to the problems of endangerment.

This game is designed not to test students' knowledge but to introduce or remind them and you of the many personal ways you can contribute to the continuation of habitat and the animals and plants who live there.

Each time a team member gives an acceptable solution to the presented problem, the team receives one random letter in the name of an endangered animal. The whole team may participate in guessing the animal. A missed answer/solution receives no letter. The correct solution to the problem is read to both groups. The other team then draws a card for a turn.

Background Information

This section includes:

A. Common Reasons for Animal and Plant Endangerment

B. Suggested Endangered Animal Names for Team Wins

C. Problem/Solution Cards for Teacher Preparation

A. COMMON REASONS FOR ANIMAL AND PLANT ENDANGERMENT

For information on reasons for extinction, read the Teacher Information Packet.

1. Animal/plant habitat is destroyed or fragmented — from logging, farming, urban growth.

2. Animals or plants can't adjust to encroaching human activity.

3. Animals/plants are eaten as food.

4. Animals/plants are killed for profit.
EXAMPLES: fur from many wild cats, elephant tusks, tortoiseshell

5. Animals/plants are captured as pets or kept in collections.
EXAMPLES: chimpanzees, parrots, cactus, butterflies, snakes

6. Animals are used in biomedical research.

7. Animals are destroyed by humans in predator control efforts.
EXAMPLES: coyotes, wolves, tigers

8. Animals/plants are killed by pollution of habitat.

9. Animals are hunted for sport.

10. Animals/plants are stressed and destroyed by an expanding human population that uses more land, water and other resources.

11. Human-introduced animals and plants drive out native species.
EXAMPLES: starlings introduced into North America and pigs and chickens introduced on the Hawaiian Islands

B. SUGGESTED ENDANGERED ANIMAL NAMES FOR TEAM WINS

Look through the Animal Profiles and other lists of endangered and threatened animals in the Zoo in the Teacher Information Packet.

Here are a few examples: Asian elephant, Humboldt penguin, chimpanzee, snow leopard.

For younger students, you may give extra points for each team member that saw the animal at the Zoo.

C. PROBLEM/SOLUTION CARDS FOR TEACHER PREPARATION

Remember some problems have more than one solution

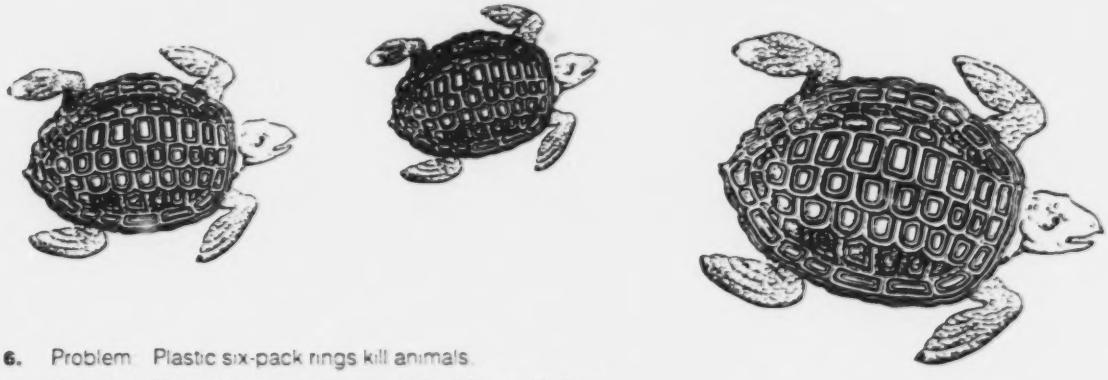
1. Problem: Trees are cut down to make grocery bags.
Solution(s): Recycle bags.
Take cloth bags or boxes to supermarkets for your own groceries.

2. Problem: Some fast food places use tropical beef in their hamburgers.
Solution: Find out where the beef comes from and go to the places that don't use beef from land that was once rainforest.
Solution: Write to the manager of that restaurant and explain why you are no longer patronizing this restaurant.

3. Problem: Fishing for Yellowfin tuna catches porpoises.
Solution: Buy only white (albacore) tuna fish not light tuna fish.

4. Problem: Zoos have limited space and resources to protect and breed endangered animals.
Solution(s): Find out about the zoo's animal adoption program in order to help buy food (so zoo can keep more animals).
Habitat preservation is the best way to save endangered species.

5. Problem: Helium balloons are eaten accidentally by sea turtles and whales who then die.
Solution: Don't release or let go of any helium balloons. If some organization you know about is doing a balloon launch, let them know about the potential harm of long-drifting balloons.



6. Problem: Plastic six-pack rings kill animals.
Solution: Snip all six-pack rings and don't litter with them.

7. Problem: Cars and fossil-fuel burning factories pour carbon dioxide, a greenhouse gas that may be warming up the world's climate, into the air.
Solution: Make sure emission control on your automobile is functioning properly.
Solution: Plant trees, which absorb carbon dioxide.

8. Problem: Air pollution destroys animal and plant habitats.
Solution: Look for ways to conserve energy and not burn as much polluting fossil fuel.

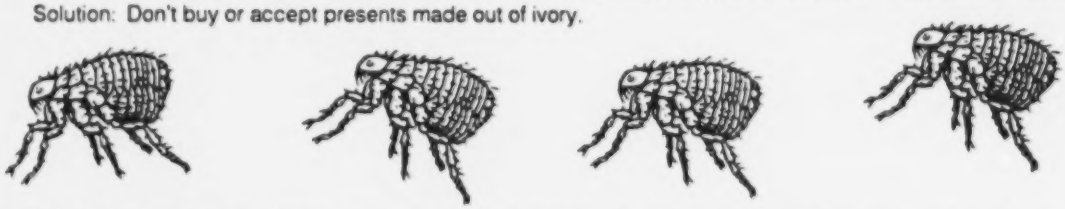
9. Problem: One issue of *The Oregonian* requires 410 tons of paper. The loss of forests is the single argest contributor to animal extinction.
Solution: Recyle newspapers. If all *Oregonian* subscribers recycled, 2000 trees a day would be saved.

10. Problem: Insecticides, "bug killers," destroy all insects, even the "helpful" ones such as lady bugs.
Solution: Use organic methods to handle garden pests. Spray with non- poisonous products.

11. Problem: Products such as nail polish, cosmetics and motor oil when poured down the drain or thrown in landfills, eventually seep into the rivers and ground water around you.
Solution: Use other safe products that are not poisons.
Solution: Dispose of toxic (environmentally damaging) products on hazardous waste collection days. Call Metro or your disposal service for more information.

12. Problem: Cities destroy many places that would have been habitat for birds. There are often not enough trees or grasses in cities for birds to nest.
Solution: Build a bird house or two in a protected corner of your yard.

13. Problem: People buy ivory as presents. Hundreds of thousands of elephants have been killed for their tusks.
Solution: Don't buy or accept presents made out of ivory.



14. Problem: Pet owners put flea collars and use other dangerous poisons (pesticides) on their dogs and cats.
Solution: Bathe your pet frequently to drown fleas. Use a flea comb with small teeth to trap the fleas.

15. Problem: Animals are sometimes injured by litter such as cigarette butts, plastic wrappers and Styrofoam.
Solution: Drop litter in trashcans not on the street or around the countryside.

16. Problem: Rainforests are being cut down at the estimated rate of about 100 acres per minute. They are home to over half the world's plant and animal species.
Solutions: Talk to friends, parents, teachers, and to everyone you know about the importance of saving this important habitat.
Organize a letter writing campaign to your congressional representatives to ask them to help protect rainforests.

17. Problem: Americans buy 2 million batteries a year. Most of them are made to be thrown away and they contain toxic chemicals.
Solution: Buy rechargeable batteries.

18. Problem: Turning the heat up uses more energy which pollutes the environment one way or another.
Solution: Turn down the thermostat in winter and put on a sweater.

19. Problem: Car exhaust (fumes) contain invisible gases that add to the greenhouse warming and pollution of the earth.
Solution: Take public transportation or ride a bicycle.

20. Problem: Schools buy more books than anyone else in the country. Very few are printed on recycled paper.
Solution: Write to your textbook publishers and ask them to print on recycled paper.

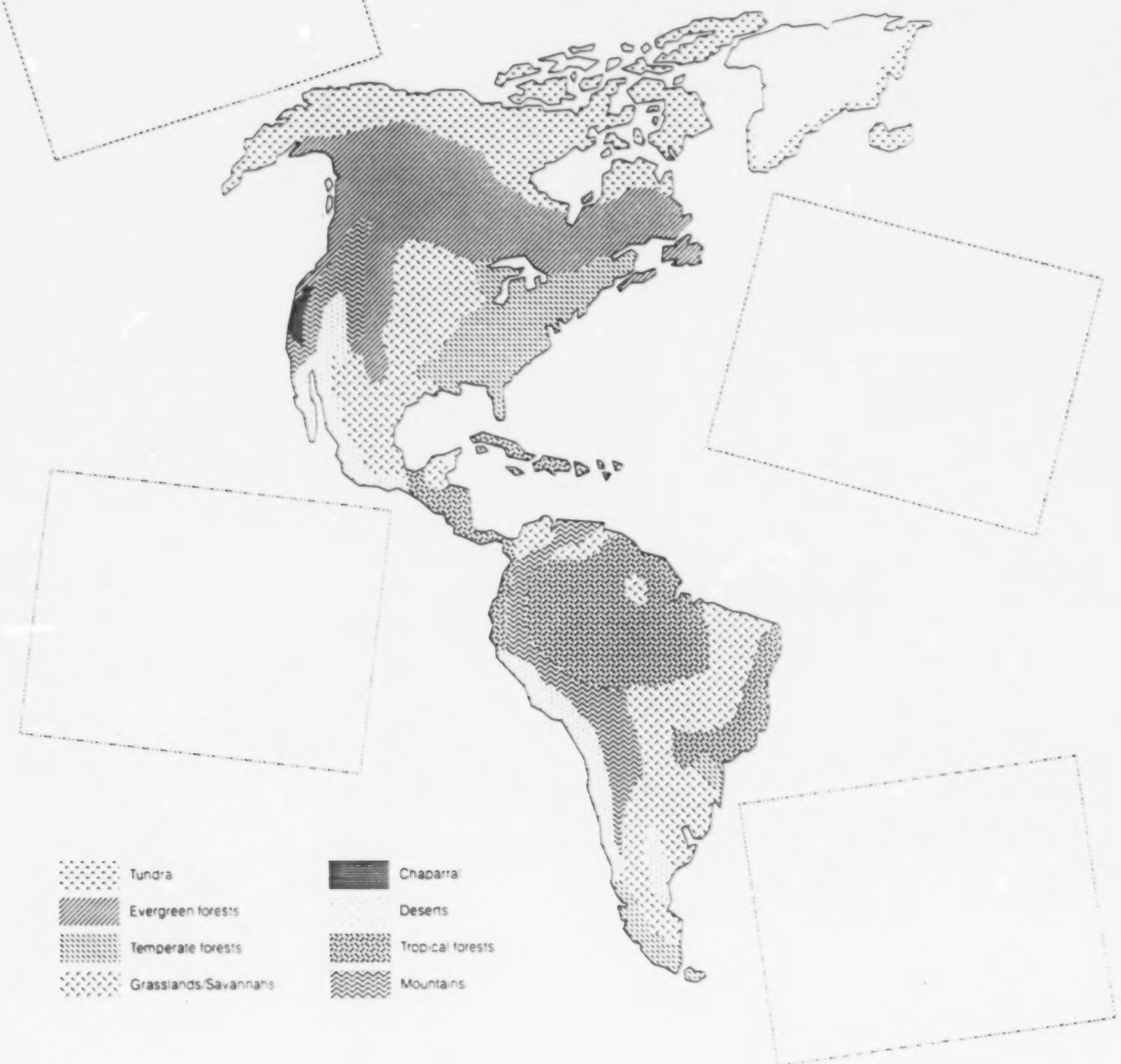
21. Problem: You want to read more about endangered species and other important environmental issues.
Solution: Go to the library and find out what is available about these topics.

Where in the World?

(A vegetation zone map)

ZOO EXHIBITS TO VISIT: Big Cats, Bears, Penguins, Primates, Elephants, Africa, Alaska Tundra

Match the pictures of endangered animals to their homes on the map.



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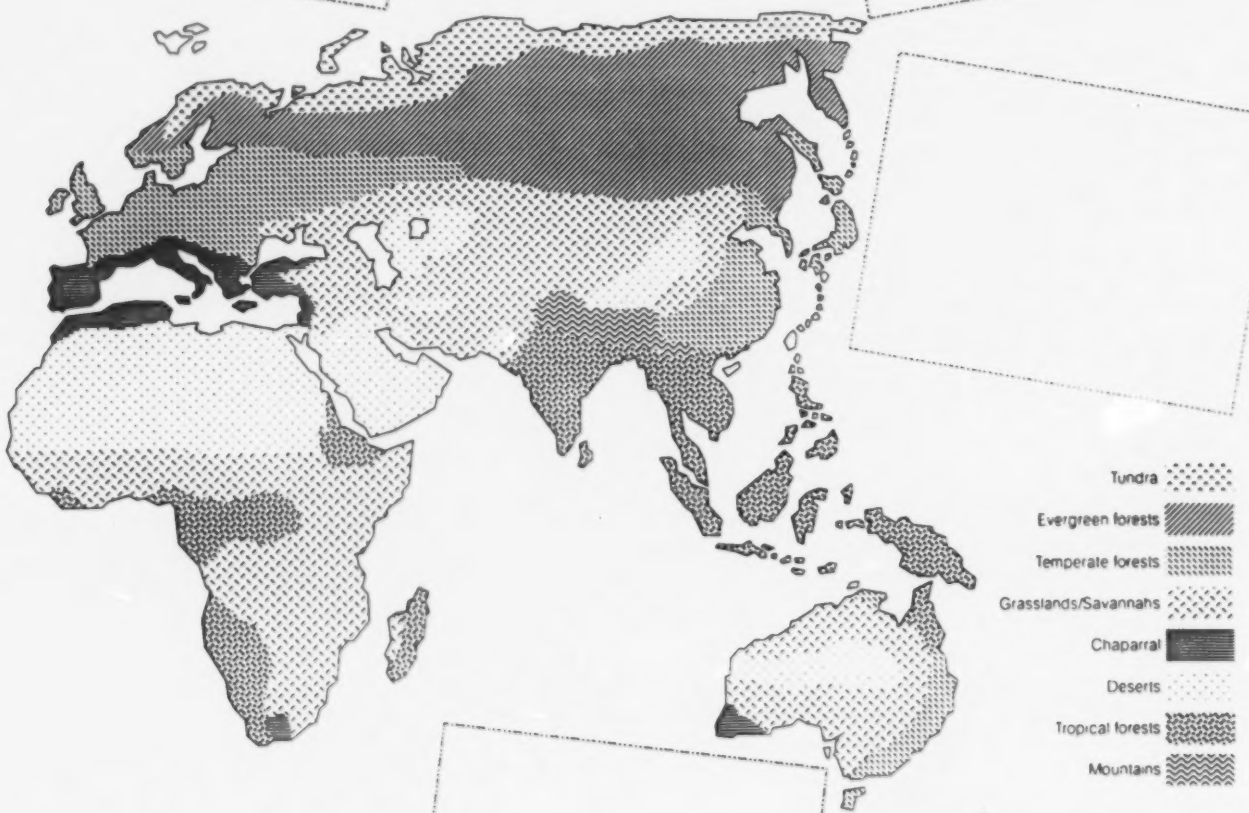
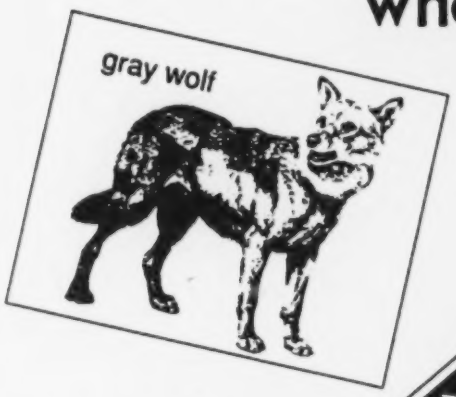
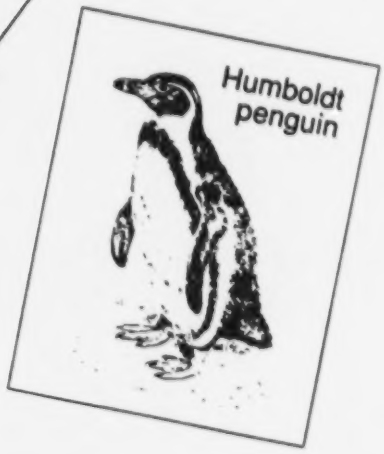
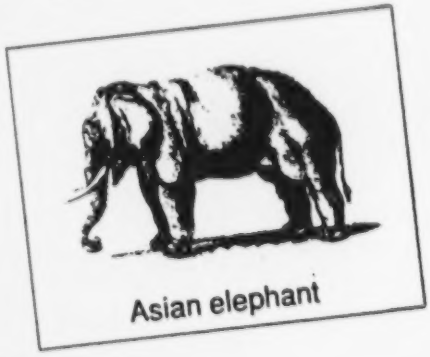


Where in the World?

Match the pictures of endangered animals to their homes on the maps







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Where in the World?

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.1, 1.6, 1.11, 1.14
2.0 Processes: 2.4
4.0 Interests: 4.4
6.0 Interactions: 6.1, 6.2, 6.4

Objectives

- Review the variety of vegetation zones or biomes found on the Earth.
- Place endangered animals in the appropriate vegetation zones and continents.
- Identify biomes where endangered animals are concentrated.

Directions

Make copies of the blank vegetation zone maps and the animal pictures for each student. This activity can be done before or after your visit to the Zoo. If you do it before, have students research the location of each animal pictured.

AT THE ZOO

Instruct students to find the pictured animals and find each animal's location on the range map included in the exhibit labels.

BACK IN THE CLASSROOM

Have the students color the vegetation zones on each map and label them. Cut out each animal and place it in the correct location on the map.

Use the *Endangered/Threatened Species Inventory and Location at the Zoo* located in the Teacher Information Packet. Mark on the map where each of the 32 selected endangered species is located.

In which life zone are endangered animals concentrated?

The majority of endangered animals at the Zoo come from tropical forests. This is no surprise because the greatest diversity of living things is found in tropical forests and tropical forests are being destroyed at an alarming rate.

Answer Key

The answer key for this activity can be found in the Teacher Information Packet under *World Map of Vegetation Zones/Biomes*.

Background Information

Detailed background information for this activity can be found in the Teacher Information Packet under *Vegetation Zone/Biome Information*.

A Step Further

This activity can be expanded into a classroom project by making a world map on the bulletin board. Have students draw or cut out magazine pictures of endangered species to pin on the big map.

To study the features of each vegetation zone, have students research and create a little "diorama" of each biome.

An understanding of the different vegetation zones is enhanced by showing films about each biome. Check the *Resources* in the Teacher Information Packet for ideas and sources.

Who's Afraid of the Wolf?

ZOO EXHIBIT TO VISIT: Alaska Tundra

Once upon a time, the wolf was a symbol of our fear of nature, our struggle against it; now it has become a symbol of our fear for nature, the environment that is all of ours.

— Erik Zimen, *The Wolf, a Species in Danger*

Visit the Alaska Tundra exhibit to collect data about wolves.

How many wolves in a pack?

_____

What is the maximum range of a wolf pack in Alaska?

_____

How much land does each wolf require?

_____

What is the relationship between wolves and caribou?

_____

_____

How are wolves beneficial to caribou herds?

_____

_____

Find one more fact about wolves and write it down.

_____

Area of Yellowstone National Park: 3468 square miles (8983 square km)

If each wolf needs 10 square miles (26 square kilometers), how many wolves could survive in the park?

_____

If each pack has 10 members, how many packs in the park?

_____

Read the article about reintroducing the wolf to Yellowstone National Park.
How does each of these groups feel about reintroducing the wolf:

	pro-wolf	anti-wolf	neutral
Renee Askins			
the Wolf Fund			
ranchers			
elk, bison, deer			
William Penn Mott			
wolves			
the author			

How do you think other people not mentioned in the article might feel? Why?

A park ranger in charge of managing the park _____

A hotel manager who runs a lodge for tourists in the park _____

A park visitor who plans on camping _____

An elk hunter outside the park _____

What are the advantages and disadvantages of reintroducing the wolf?

to the park _____

to the elk, bison and deer populations _____

to the visitor _____

to the hotel manager _____

to the rancher _____

to the wolves _____

Will the wolves stay in Yellowstone? _____

Who's Afraid of the Wolf?

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.6, 1.11
2.0 Processes: 2.15
4.0 Interests: 4.1
5.0 Values: 5.1, 5.2, 5.6
6.0 Interactions: 6.1, 6.2, 6.5

Objective

• Examine and evaluate the values and decisions involved in reintroducing the gray wolf to a national park.

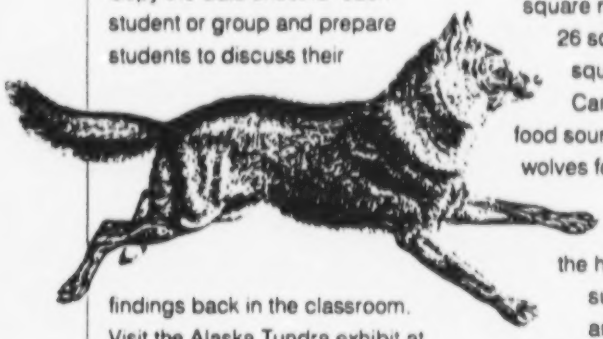
Directions

Begin with a class discussion to identify pre-existing attitudes and ideas about wolves. Questions you may wish to include are:

- Has any of us seen a wolf in the wild?
- What do wolves eat?
- How dangerous are they to humans?
- Can you think of some stories or fables which contain wolves?
- How are the wolves portrayed?
- Where does our opinion of wolves originate?

AT THE ZOO

Copy the data sheet for each student or group and prepare students to discuss their findings back in the classroom. Visit the Alaska Tundra exhibit at the Zoo to collect more data about wolves.



According to the labels at the gray wolf exhibit, wolves live in packs of 10 or more members. The maximum range of a wolf pack in Alaska is 13,000 square kilometers or 5200 square miles. Each wolf requires 26 square kilometers or 10 square miles of land.

Caribou are an important food source for wolves and the wolves follow the caribou herds. Wolves prey on old and sick animals in the herd and ensure the survival of the healthiest animals.

BACK IN THE CLASSROOM

Follow this data collection and discussion with the article about Yellowstone National Park. Share the following facts with the students to introduce the article.

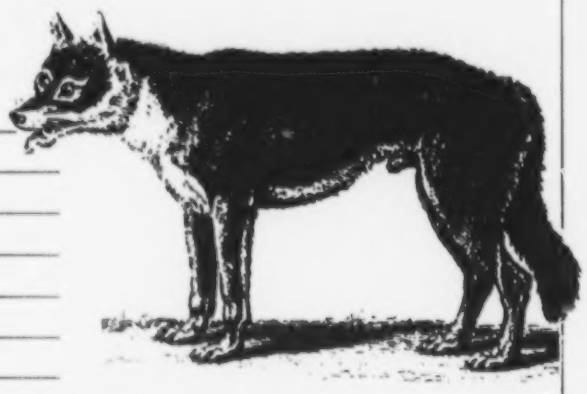
Wolves were once found throughout North America, Europe and Northern Asia. In North America this area has shrunk to Alaska and Northern Canada and a very few places in the continental U.S. Suitable wolf habitat exists in many places the wolves once roamed. To preserve and restore wild areas and encourage the wolf's survival, some people advocate reintroducing the wolf. Some of the best wolf habitat is found in large national parks. The parks were created to preserve and maintain an area in its natural state. If this environment traditionally included the wolf, should the wolf be reintroduced to restore the park to its true natural condition?

Today people still believe that wolves are fierce and attack humans, although in fact they rarely do. This fear goes back hundreds of years to the time when Europe was covered with huge forests that people had to cross to travel from town to town. The forests contained plenty of wolves as well as other wild animals. . . Naturally, the people were afraid and many stories were told about the dangers of the forest.

— Malcolm Penny, *Endangered Animals*

Answer Key

	pro-wolf	anti-wolf	neutral
Renee Askins	X		
the Wolf Fund	X		
ranchers		X	
elk, bison, deer		X	
William Penn Mott	X		
wolves	X		
the author	X		



The groups mentioned in the article have fairly clear positions on wolf reintroduction. The article favors a positive point of view concerning the wolf, thus the anti-wolf arguments are not stressed. Challenge the students to identify this bias in the article. To find out more about other perspectives, assign them to groups of students and have them research and build a case for their side.

The article does not tell us how other groups might feel. Possible responses are:

A PARK RANGER in charge of managing the park: Wolves may be viewed as a management problem by some. Yellowstone must manage its existing grizzly bear population very carefully to prevent negative encounters between bears and visitors. Others may wish to fulfill the park's mission of restoration and preservation and bring the wolf back. A variety of opinions probably exists among park staff.

A HOTEL MANAGER who runs a lodge for tourists in the park: The tourist industry in the park will probably react the same as public opinion in general. The presence of wolves may attract or drive away business depending on attitudes. If visitors favor the reintroduction, the tourist industry probably will, too.

A PARK VISITOR who plans on camping: Visitors may be concerned about the presence of wolves in the park and may feel unsafe camping. Others may be drawn by the opportunity to see or hear signs of wolves in the wild.

An ELK HUNTER outside the park: Hunters may view the wolves as competition for game animals. Or they may value the wolves' role in maintaining a healthy elk population. Some hunters may consider it an opportunity to hunt wolves once they leave the park.

WOLF REINTRODUCTION

One of the trickiest aspects of reintroduction is the fact that the wolf population will probably grow if it is successfully re-established. As the number of wolves increases migration out of the park is the logical outcome. Management of wolves outside the park becomes a more complicated and controversial issue.

The controversy over wolf reintroduction has been going on in Yellowstone for decades. The Park Service has done a study of this issue, but no plan has been implemented. In the end the issue boils down to what should a park be? Should it be a perfectly preserved natural ecosystem or should the needs of park visitors and nearby residents take priority? Some kind of compromise between these two sides is usually the outcome.

She Wants to Bring Back the Wolves

By Michael Ryan
Reprinted from *Parade*, May 13, 1990

If you drive down to Yellowstone National Park behind Renée Askins, expect to spend a lot of time pulled over at the side of the road.

"Did you see that?" she demanded on one wintry day racing back to my Jeep, her face flushed with enthusiasm. I scanned the sere landscape and saw only barren land, some lonely trees and a frosty river. "Look, over there," she again demanded. "Can't you see it?" It took binoculars and a great deal of patient explaining on her part, but finally I saw it, in the mid-branches of a bare cottonwood tree: a bald eagle, America's symbol, perched regally above its domain.

How on earth, I asked myself, had she picked it out in all of Montana's vastness as she raced down the road at 50 mph.

As we rolled along, she stopped again and again. "Did you see that? Did you see that?" She found the bald eagle's mate in another tree, a herd of mule deer browsing low in a valley, a bighorn sheep on a precipice. Later, deducing the presence of a coyote, she let out an ear-piercing cry; the coyote, hidden in the woods on a steep hillside, answered her note for note.

Renée Askins is a young woman with a mission that only seems strange until she explains it: to bring wolves back to Yellowstone. "This is my life," she said after we pulled into Mammoth Hot Springs in the north end of the park. "I've spent years on it. There's such despair about the environment that people need a tangible success. Maybe if we can put wolves back into Yellowstone, we can clean up acid rain next."

Wolves. Many of us grew up believing they are the most brutal of beasts: capable of attacking children, furious when in packs, cowardly when alone, deserving of our contempt and our bullets. But to spend a few days in Yellowstone with Renée Askins is to learn a few new truths about these much maligned animals — and a lot about a courageous young woman who thinks she can single-handedly help save one of nature's marvels from humans and save us from our fears.

The first time I saw Askins was in Bozeman, Montana, where the state university had organized a conference on wolves. She stood on the stage of a large lecture hall, before an audience containing dozens of ranchers. Wolves are a sensitive issue for ranchers; they argue that nothing will prevent the animals, once released in Yellowstone, from crossing park boundaries and preying on livestock. "I'm not raising my sheep to feed your wolves," one man told her heatedly, and others rose repeatedly to criticize her. But Askins never lost her calm demeanor. "This is an issue of change," she told them. "It will involve sacrifice for both sides."

> *"Wolves are extraordinary — they challenge us to accept wildness."*

There are good reasons to return wolves to Yellowstone. They were once an important part of the park's ecosystem, feeding mainly on sick and old herds of elk, bison and deer, keeping their population in delicate balance. At the turn of the century, however, most of the region's wolves were exterminated by shooting or poisoning. Today, a visitor here in the dead of winter is struck by the herds of bison and elk rooting through the deep snow, foraging for any vegetation they can find. Returning the wolf to this habitat could eliminate such scenes.

"Wolves are extremely shy of humans," Askins maintains, quoting scientific evidence. She concedes wolves sometimes will attack domestic animals, but normally only when deprived of their natural prey. When they see people, they flee.

But why would a 31-year-old biologist with a master's degree from Yale in wildlife ecology devote her life to this wild beast? Renée Askins began to study the wolf when she was a student at Kalamazoo College in Michigan, but her passion for the animal began when she was doing a project at a wolf-reseach facility. A female in the pack of captive wolves had been unable to protect her pups from other animals. "The park's director

walked in with a tiny little ball of fur, 2 days old, handed it to me and said, 'Here. Raise her,'" recalls Askins.

Askins named the pup Natasha. For the next few months, the reseacher became the young wolf's link to the world. "She was bottle-fed every couple of hours in the early stages," says Askins. "I had to get up all through the night. She was always vocal — always nudging, whimpering and interacting. She liked to sleep right on my heart — I think the pulse really calmed her." But Askins never lost sight of the wolf's independence — and the limits to their relationship.

"People think she felt I was her mother," Askins says. "I don't think that was true for one minute. She was an independent life. I used to have this fantasy that, every day, when I was keeping this journal about what Natasha did, she would want to write about me: 'Today, the girl did this, this and this.'"

She soon was given three other wolf pups and two sheepdog pups to raise together. "The only way they'd go to sleep was if they had something to suck on," Askins recalls. "I slept on the floor, and each one had a finger or toe." As she continued to study the wolves, Askins was stunned by the complexity of their communications: "The fact that they are family groups, that all pack members contribute to the survivorship of the group," she says. "The interaction, the play, the hunting, the vocalizations, the expressions. Wolves are extraordinary — they challenge us to accept wildness."

It was a short journey from that project to working full-time on the idea of reintroducing the wolf to Yellowstone. As president of The Wolf Fund, Askins speaks and raises money for her project, and she has engaged the interest of William Penn Mott, former director of the National Park Service, in the issue of wolf recovery. It is far from settled, but if Renée Askins has her way and if the U.S. government agrees, she calculates that several "breeding pairs" could be moved down to Yellowstone from Alberta, Canada, at a cost of about $350,000 for each of the first few years until they are fully established. The ecology of the park, which mankind disrupted close to a century ago, would return to something like what nature intended.

It was a cold afternoon, and we went out on cross-country skis into Yellowstone's Lamar Valley. Suddenly, Renée Askins stopped and pointed to a hillside covered in aspen. "You see what I mean?" she asked, her eyes gleaming. "This is the perfect wolf habitat."

Maneaters

Read this news story carefully and answer the following questions using information from the article.

Changes

How many tiger attacks happened between 1967 and 1978? _____

How many tiger attacks have happened since 1978? _____

What kind of habitat do tigers like? _____

_____

What kind of habitat do tigers not like? _____

_____

How has the habitat changed in recent years? _____

_____

Taking Sides

Here is a chart with the names of all the individuals mentioned in the story. Put a check in the column you think matches their position in the conflict.

	pro-tiger	neutral	anti-tiger
Arjan "Billy" Singh			
government officials			
Shiv Shanker			
Ashok Singh			
Rupinder Singh			
farmers			
tigers			

How does Arjan Singh explain the changes in tiger behavior? _____

_____

How does Rupinder Sigh explain the changes in tiger behavior? _____

_____

How does Ashok Sigh explain the changes in tiger behavior? _____

_____

Who is right? _____

_____

Solutions

What would you recommend to solve the problem of man-eating tigers? _____

_____

CLASSROOM ACTIVITY

Indian tigers stalking man spark dispute

By William Claiborne, LA Times-Washington Post Service
Reprinted from *The Sunday Oregonian*, June 5, 1983

PALIA, India — Man-eating tigers that roam the jungle along the Indian-Nepalese border have plunged the frightened farmers and concerned wildlife conservationists into a bitter controversy over a government campaign to destroy the wild beasts or trap some of them for zoos.

The farmers say the tigers have lost their instinctive fear of man and have acquired a taste for human blood, and as a result are terrifying the countryside in this remote part of the Indian state of Uttar Pradesh. Since 1978, 105 people have been killed by tigers, the most recent on March 22, when the body of a forest worker was found with an arm and a leg missing.

The government, according to the conservationists, has bowed to local political pressure without regard for the future of the fabled jungle cats — who since 1971 have been protected by a ban on shooting by hunters.

At the center of the dispute is Arjan "Billy" Sigh, 66, a hunter-turned-conservationist who has led a campaign to have wayward tigers humanely lured back to their protected preserve in Dudwa National Park here and to create an encroachment-free buffer zone around the tigers' habitat.

The controversy surrounding Singh has been heightened by attempts by some government officials to blame 22 man-eating cases on a zoo-born tigress that the conservationist brought here from Britain as a cub, raised at home and then introduced into the jungle in an experiment designed to increase the world's dwindling tiger population.

Singh, one of India's best known wildlife experts, proved by comparing markings that his tigress, Tara, was not the man-eater shot by park officials in November 1980 after killing five people, and he has since led the battle against destroying tigers or condemning them to captivity to appease public outcry over man-eating cases.

"The human, under normal circumstances, is not the tiger's prey species. What we have done is to force the tiger to turn on man by denigrating his habitat, and then we say there is no other way to solve this problem except to destroy the tigers," Singh said.

Seven tigers branded as man-eaters have been killed in the past five years, and one was trapped and sent to a zoo in Lucknow last month after being identified as having killed three people and attacked a fourth. Three tigers sent from the wild to the Lucknow zoo have died in captivity, and the one sent there last month is reported to be in deteriorating condition because of the abrupt change in environment.

The survivor of an attack on March 9, Shiv Shanker, 60, a night watchman, said in an interview that he was guarding a wheat field when a tiger grabbed him by the thigh and began to drag him away.

"I knew I was going to die, so I hit at the tiger," Shanker said, displaying a scar on his leg. He said a kerosene lantern tipped over and started a fire. The tiger, after snarling and lashing its tail menacingly for a while, let him go and went away.

Singh and several area farmers agreed that the 60 tigers in the 200-square-mile Dudwa National Park increasingly have stayed outside of the preserve during the past five years and have become more agressive toward humans. In the previous 16 years, there had been only two or three reported man eatings.

The park director, Ashok Singh, said one reason is an increase in sugar-cane acreage adjacent to the park. Previously it was bordered by grass fields, which were not suitable habitat for the tigers and which tended to keep them contained in the preserve. But the encroachment by farmers planting cane closer to the park's edge has enlarged the tigers' preferred habitat and has drawn them closer to areas populated by humans.

Rupinder Singh, a prosperous farmer whose cane fields have gradually been expanded closer to the park's perimeter, acknowledged in an interview that the changing environment had altered the tigers' behavior. But he said the government has a responsibility to protect the local citizenry.

"You see, they are no longer afraid of man. It used to be that they would run away from you. Now, they feel that dogs and humans are easy catching," said the farmer, who has allowed the park officials to install a baited trap in his cane fields to capture tigers.

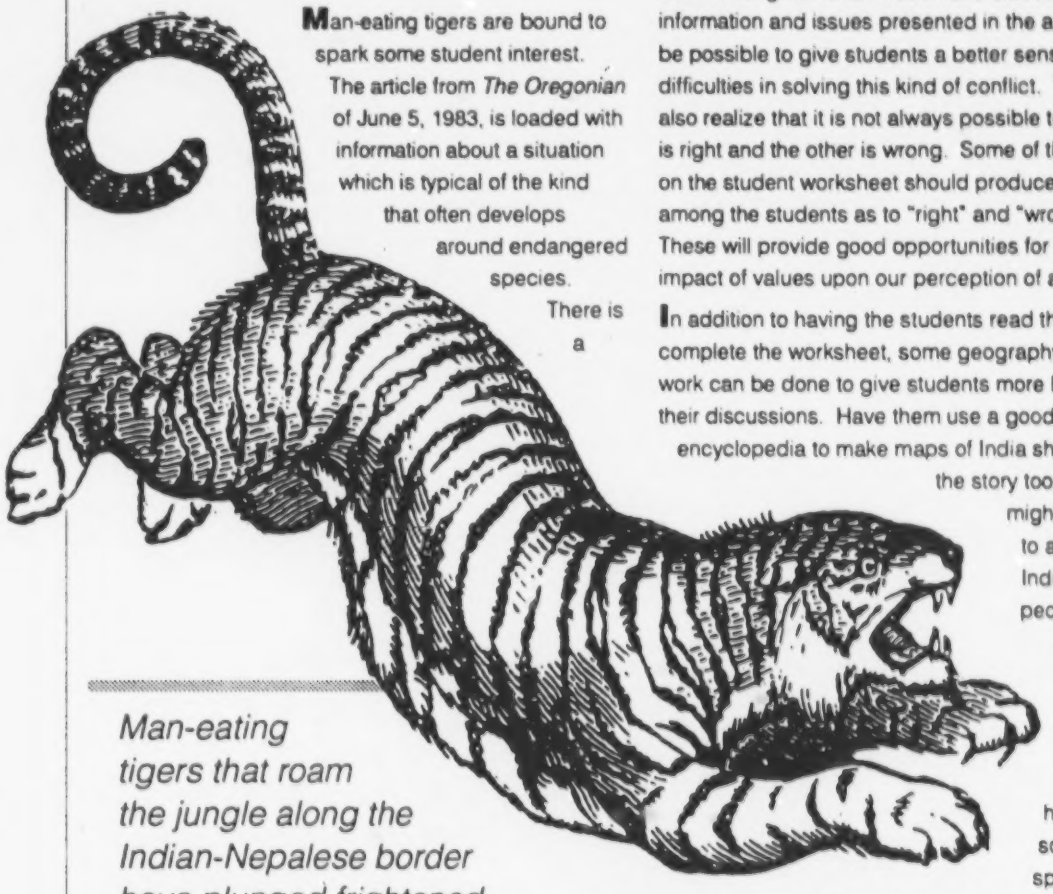
Arjan Singh, meanwhile, is battling attempts to kill or trap suspected man-eaters. He is also seeking to overturn an Indian Borad for Wildlife ban on introducing to the wilderness tigers or leopards that have been reared in captivity.

Singh, who still monitors the movements of Tara and who last month watched from an observation blind while the tigress and her cubs ate at a water buffalo staked out as bait, said he believes the ban on reintroduction and the labeling of Tara as a man-eater were designed to discredit his experiments.

Maneaters

CLASSROOM ACTIVITY

1.0 Concepts: 1.1, 1.2, 1.6, 1.11
2.0 Processes: 2.3, 2.5
4.0 Interests: 4.1
5.0 Values: 5.1, 5.2, 5.6
6.0 Interactions: 6.1, 6.2, 6.5



Man-eating tigers that roam the jungle along the Indian-Nepalese border have plunged frightened farmers and concerned widlife conservationists into a bitter controversy over a government campaign to destroy the wild beasts or trap some of them for zoos.

Man-eating tigers are bound to spark some student interest. The article from *The Oregonian* of June 5, 1983, is loaded with information about a situation which is typical of the kind that often develops around endangered species. There is a conflict between human needs and animal needs.

There is also a conflict between the points of view of different groups of people involved. By leading students through an examination and discussion of the information and issues presented in the article, it should be possible to give students a better sense of the difficulties in solving this kind of conflict. They should also realize that it is not always possible to say one side is right and the other is wrong. Some of the questions on the student worksheet should produce disagreement among the students as to "right" and "wrong" answers. These will provide good opportunities for discussing the impact of values upon our perception of a situation.

In addition to having the students read the article and complete the worksheet, some geography and math work can be done to give students more background for their discussions. Have them use a good atlas or encyclopedia to make maps of India showing where the story took place. This might be extended to a short study of India and its people.

Using information from the article, have them calculate how many square miles of space is available for each tiger in the park. Then have them use an atlas to find the area and population of India and calculate a similar figure for the human population. These numbers are technically not comparable, but can be used to lead students to an understanding of the competition for space (habitat) that is part of the conflict in the story.

Answer Key

How many tiger attacks happened between 1967 and 1978? (2 or 3)

How many tiger attacks have happened since 1978? (105)

What kind of habitat do tigers like? (The article does not state specifically what tigers like but does mention jungle and the fact that sugar cane fields were places tigers would go. It is possible to conclude that tigers like places with dense vegetation in which to hide.)

What kind of habitat do tigers not like? (They do not like the open grassy areas that used to surround their jungle reserve.)

How has the habitat changed in recent years? (Farmers have changed some of the open grassy areas into sugar cane fields.)

With this information it will be possible to discuss how the changed behavior of tigers is related to a change in their habitat.

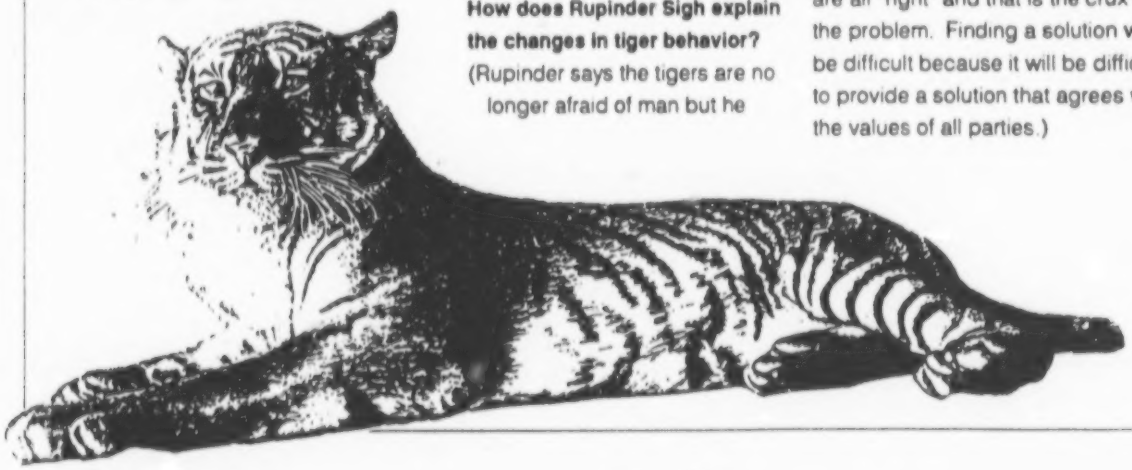
How does Arjan Singh explain the changes in tiger behavior? (Arjan says the tigers have been forced to turn on man because the tigers' habitat has been degraded. The news story uses the word "denigrating" which students may need help with.)

How does Rupinder Sigh explain the changes in tiger behavior? (Rupinder says the tigers are no longer afraid of man but he also acknowledges that a changed environment has changed the tigers' behavior.)

How does Ashok Sigh explain the changes in tiger behavior? (Ashok says the increase in sugar cane acreage around the park has allowed the tigers to move from the park into areas closer to humans.)

Who is right? (All three of these explanations have some validity and although they may sound like they disagree they are all basically saying the same thing. The real disagreement arises from the values of the individuals and what they want done about the tigers. They are all "right" and that is the crux of the problem. Finding a solution will be difficult because it will be difficult to provide a solution that agrees with the values of all parties.)

	pro-tiger	neutral	anti-tiger
Arjan "Billy" Singh	X		
government officials	X	X	X
Shiv Shanker			X
Ashok Singh	X		
Rupinder Singh			X
farmers			X
tigers	X		



Compare the Bears

ZOO EXHIBITS TO VISIT: Polar Bear, Sun Bear

Compare Bear Habitats

Draw a line to the bear that best fits each description.

sun bear

which bear?

lives in trees?

lives where there are no trees?

stays on dry land?

spends much time in the water?

eats mostly large animals?

eats mostly fruit, insects and small animals?

lives in cold climate?

lives in a warm climate?

polar bear

Can you list any other differences between sun bear and polar bear habitat?

Compare Bear Adaptations

Write down a description of each bear's adaptations and the survival advantage of each adaptation.

Adaptation	sun bear	polar bear
length of fur advantage		
size advantage		
color advantage		
feet advantage		
claws advantage		
other adaptation advantage		

Compare the Bears

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.6, 1.8, 1.11
2.0 Processes: 2.1, 2.5, 2.6, 2.7
6.0 Interactions: 6.4

Objectives

- Compare the habitats and adaptations of polar bears and sun bears.
- Identify the connections between adaptations and habitat.

Directions

Copy the worksheet for each student before you visit the Zoo.

Information about habitat and adaptations can be collected at the Zoo or researched at school before your visit.

AT THE ZOO

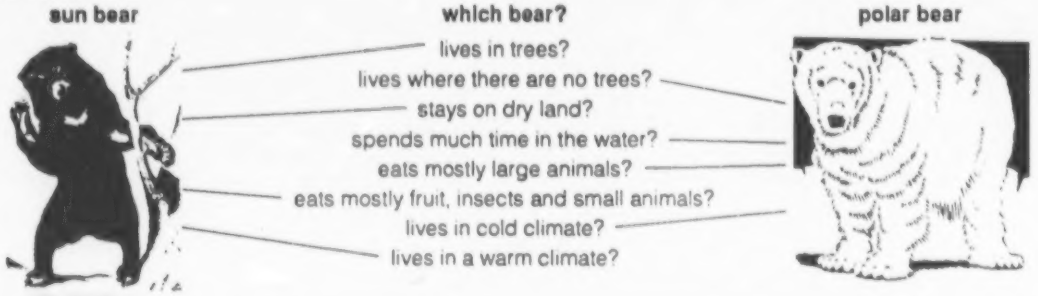
Instruct students to make careful observations of each species of bear. Answers can be found on labels if bears are not fully visible. The first section of the worksheet directs students to notice differences between the bears' habitats.

The second section focuses on adaptations which help each bear survive in its habitat.

BACK IN THE CLASSROOM

Discuss the advantage of each adaptation in each habitat. How do these adaptations suit each bear to its habitat? What if the sun bear and polar bear traded places? Because animals are adapted to specific environments, they are dependent on specific habitat for survival.

Answer Key


sun bear
which bear?
polar bear
lives in trees?
lives where there are no trees?
stays on dry land?
spends much time in the water?
eats mostly large animals?
eats mostly fruit, insects and small animals?
lives in cold climate?
lives in a warm climate?

Background Information

Polar bears are active during the day and spend much of their time in the water. Their primary source of food is ring-necked seals which also live on the Arctic ice pack. Their large size provides the power needed to hunt big animals and conserve warmth. White fur which camouflages the bear on the ice and snow makes it possible to sneak up on prey. Polar bears use their big webbed feet to paddle in the sea and fur on the soles of their feet insulates them from cold. The long strong claws help the bear catch and kill its prey.

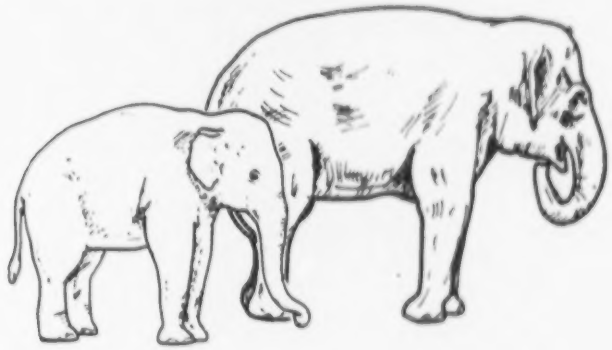
Polar bear populations are now stable or growing thanks to an international agreement to protect the bears. Mineral exploration and extraction in the Arctic could threaten the polar bear if the critical and limited denning habitat for pregnant females is disturbed.

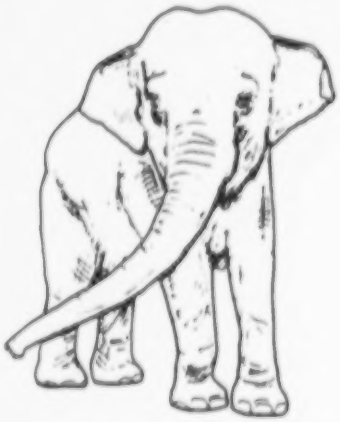
Malayan sun bears live in the tropical forests of Southeast Asia. Their diet is mainly fruit, insects and small animals which they pursue during the night. Sun bears are the smallest bears; small size makes tree-climbing easier. The black fur provides camouflage in the forest at night when the bear is active. Smooth-soled feet help the sun bear grip trees as it climbs. Its sharp claws are used to dig for insects and catch prey. The sun bear's habitat is threatened as its tropical forest home is cut down.

For more information look up each bear under *Endangered/Threatened Animal Profiles* in the Teacher Information Packet.

Elephant Family

ZOO EXHIBIT TO VISIT: Elephants





How many do you see?	Bull*	Cow	Calf	Total
Front yard				
Indoors				
Back Yard				
Total				

Add up all the elephants you see at the Zoo.

How much food and space would these elephants need in the wild?

If each adult elephant in the wild needs an average of 330 pounds (150 kilograms) of food a day, how much do all the adult elephants need a day?

# of adult elephants ____ X 330 pound/day = _____ pounds/day

Asian elephants in the wild eat a wide variety of grasses and the bark, roots, leaves and small branches of trees, shrubs and vines. Bamboo is an important food source. Elephants will also eat farmers' crops of bananas and sugar cane.

If we estimate that each adult elephant in the wild needs an average of 290 square miles (750 square kilometers) of land, how much do all the adult elephants need?

# of adult elephants ____ X 290 square miles = _____ square miles

* Not all bulls produce tusks. Tusks are an inherited trait which appears in some elephant families and not in others. Because of ivory poaching, elephants with tusks are rare in Asia. In this situation, the tuskless bulls have a better chance of surviving.

Elephant Family

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.13
2.0 Processes: 2.1, 2.3, 2.6

Objective

• To observe elephant groups at the Zoo and calculate their food and space requirements in the wild.

Directions

Make a copy of the worksheet for each student.

AT THE ZOO

Visit each viewing area at the elephant building; the outdoor yard in front, the indoor viewing room and the outdoor yard in back of the building. Instruct students to count and record how many of each kind of elephant they see. The results will depend upon the time of day and time of year since the elephant keepers move groups of elephants during each day.

BACK IN THE CLASSROOM

Discuss the students' findings. To save endangered species we need to save family groups and enough habitat to support a viable population. Why is this a challenge for elephant conservation? What is the Zoo doing to save Asian elephants?

Background Information

Bulls are always exhibited alone. Cows are always exhibited in groups. If a baby is present, it will be with its mother and two or more additional cows. These extra cows are referred to as "aunties." Just as in the wild, they help the mother feel more secure about protecting her calf.

The fact that the Zoo has both bulls and cows and thus produces calves is important to Asian elephants as an endangered species. There is a good chance Asian elephants will become extinct in the wild. By raising them in zoos, we save the species from extinction.

A Step Further

To get students thinking about how big 290 square miles of land is, figure out how long it will take to walk around it.

If one square mile is a mile on each side, it is 4 miles around. If you walk at 3 miles per hour, it will take 1 hour and 20 minutes to walk all the way around.

If 290 square miles is about 17 miles on each side, it is 68 miles around. If you walk at 3 miles per hour it will take you about 24 hours or one full day.

17 mi x 4 sides
= 68 mi / 3 miles per hour
= about 24 hours

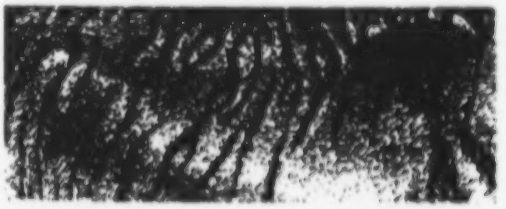
Beauty has a Price

ZOO EXHIBITS TO VISIT: Big Cats, Elephants, Africa

Find the animal at the Zoo that matches each of these pictures. Write down the name of the animal and why it is hunted. Each picture is a hint for why it is hunted.

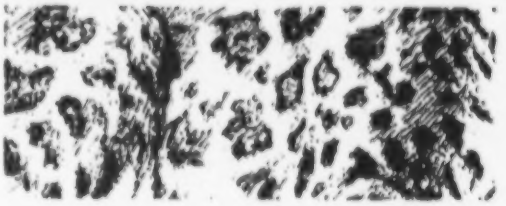
1. Animal _____

Why hunted? _____



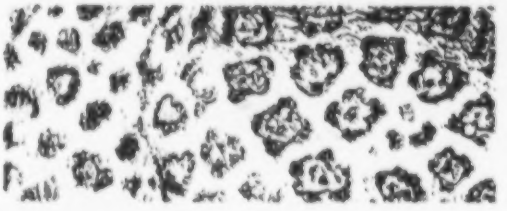
2. Animal * _____

Why hunted? _____



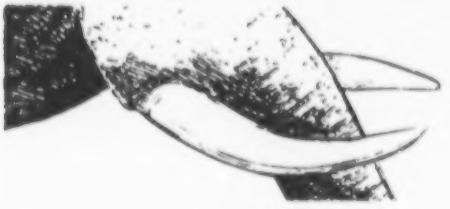
3. Animal * _____

Why hunted? _____



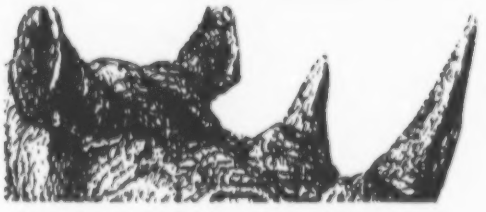
4. Animal _____

Why hunted? _____



5. Animal _____

Why hunted? _____



* Did you find it difficult to tell the cats with spotted coats apart? So do experts! This is one reason that all the spotted cats are protected. It is very difficult to tell which species a coat came from once it is off the cat.

Beauty has a Price

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.1, 1.6
2.0 Processes: 2.1, 2.5, 2.6
5.0 Values: 5.6
6.0 Interactions: 6.1, 6.2, 6.4

Objective

• To identify animals which are endangered because of the human demand for exotic products.

Directions

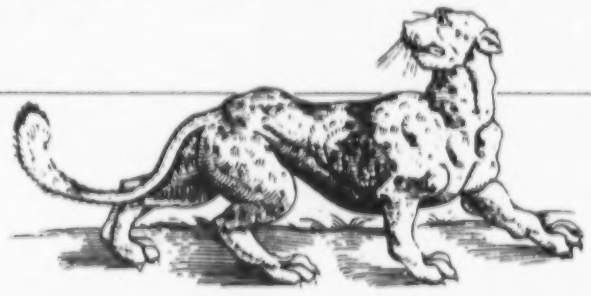
Make a copy of the worksheet for each student or group. Explain that each of these pictures shows a reason an animal is hunted. During your visit to the zoo instruct the students to find the endangered animals with these features. Have the students write down each animal's name and why the animal is hunted for profit. Discuss and compare student results back in the classroom.

Background Information

Endangered and threatened animals are protected by laws which prohibit hunting. For many animals, because of the high price offered for exotic products, this protection is not enough. Poachers frequently raid protected areas and illegally kill endangered animals. To protect these species, the illegal trade in animal products must be stopped as well as habitat protected.

Answer Key

1. Animal: Siberian tiger
   Why hunted? Tigers are hunted for their fur which is made into expensive coats.
2. Animal: snow leopard
   Why hunted? The snow leopard is hunted for its beautiful fur. Spotted fur is sold to make very expensive fur coats.
3. Animal: jaguar
   Why hunted? Like other spotted cats, jaguars are illegally hunted for their fur. Note that it is very difficult to identify which species a coat came from once it is off the cat. This is another reason that all spotted cats are protected.
4. Animal: elephant
   Why hunted? Elephants are killed for their tusks which are made into ivory jewelry and trinkets. The high prices offered for ivory encourage poachers to pursue elephants aggressively. Asian elephants are more endangered by habitat loss.
5. Animal: rhinoceros
   Why hunted? Rhinos are killed for their horns which are made into fancy dagger handles and traditional Asian medicines. The rhinoceros is the most endangered of these 5 animals.



Animals at Risk

ZOO EXHIBITS TO VISIT: Big Cats, Primates, Elephants, Africa, Penguins

Look for each of these animals at the Zoo and identify as many reasons as you can that each is at risk. Write the name of each animal next to every reason it is becoming endangerd. Most animals are endangered for more than one reason.

ANIMALS: snow leopard, jaguar, chimpanzee, red-ruffed lemur, white-cheeked gibbon, orangutan, Asian elephant, black rhinoceros, Humboldt penguin

REASON

Animals are naturaly vulnerable if they are:

1. big

2. a top carnivore

3. slow to reproduce

4. naturally found in a very small area

Animals are threatened by human activity if they are:

1. hunted or poached for profit

2. hunted as a pest to eliminate perceived danger to humans or agriculture

3. captured for the pet trade or animal research

4. living in habitat being damaged or destroyed by human use

5. competing with humans for the same food supply

Other reason?

Which one reason do all the animals have in common?

Animals at Risk

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.1, 1.11
2.0 Processes: 2.1, 2.5, 2.6, 2.8
5.0 Values: 5.6
6.0 Interactions: 6.1, 6.2, 6.4

Objectives

- Identify the reasons animals are endangered
- Connect animals to specific problems and circumstances.

Directions

Copy the Animals at Risk worksheet for each student or group. Discuss each of the reasons listed with the students before your Zoo visit. Why is each of these reasons a cause of species decline?

Big: A large animal requires more resources to survive.

A top carnivore: There are naturally fewer animals at the top of any food pyramid.

Slow to reproduce: Animals with a slow reproduction rate will recover slowly from population decline and reach the point of no return sooner.

Found in small area: If the animal's natural habitat is very limited, any habitat loss is serious.

AT THE ZOO

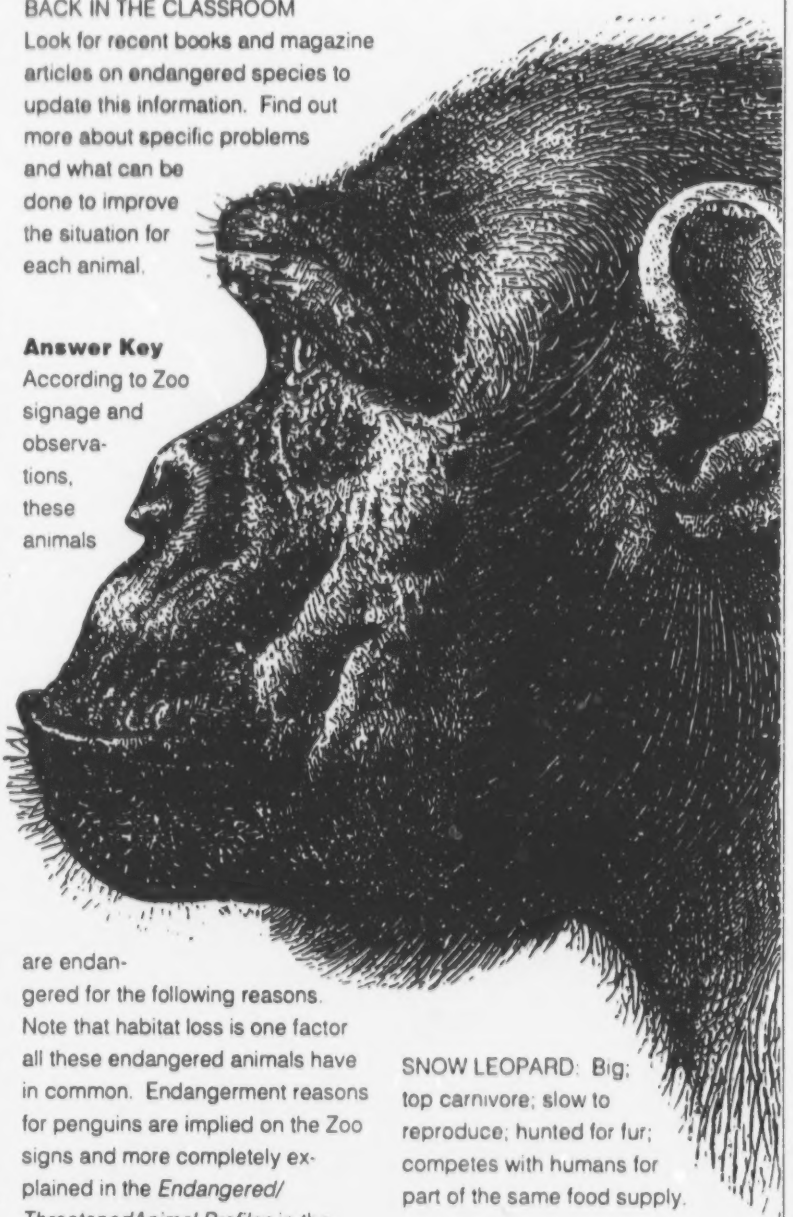
Instruct students to look for the animals at the Zoo and identify why each one is endangered. More reasons can be added to the chart if students find them. Caution students that because the status of some endangered animals is changing rapidly, information on Zoo signs may be incomplete.

BACK IN THE CLASSROOM

Look for recent books and magazine articles on endangered species to update this information. Find out more about specific problems and what can be done to improve the situation for each animal.

Answer Key

According to Zoo signage and observations, these animals are endangered for the following reasons. Note that habitat loss is one factor all these endangered animals have in common. Endangerment reasons for penguins are implied on the Zoo signs and more completely explained in the *Endangered/ ThreatenedAnimal Profiles* in the Teacher Information Packet.



SNOW LEOPARD: Big; top carnivore; slow to reproduce; hunted for fur; competes with humans for part of the same food supply.

JAGUAR: Big; top carnivore; slow to reproduce; hunted illegally for fur, shot as cattle killers; face habitat loss to agriculture.

CHIMPANZEE: Trapped for pet trade or research; habitat is being changed.

RED-RUFFED LEMUR: Found in small area; forest habitat on the island of Madagascar is being cut down for human uses. 90% of the Madagascar forest is gone.

WHITE-CHEEKED GIBBON: Small population; slow to reproduce; habitat loss.

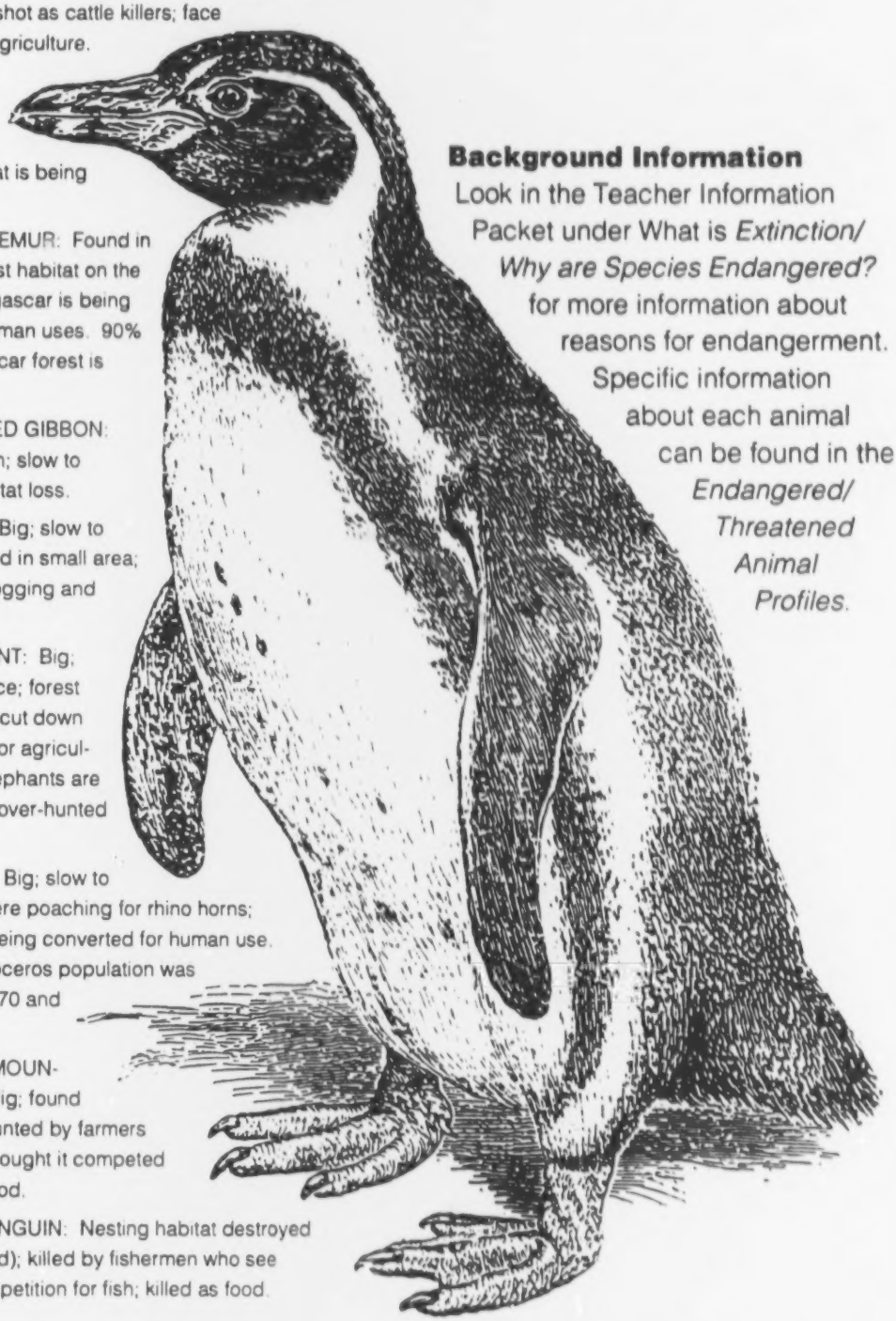
ORANGUTAN: Big; slow to reproduce; found in small area; habitat loss to logging and agriculture.

ASIAN ELEPHANT: Big; slow to reproduce; forest habitat is being cut down and converted for agriculture. African elephants are being seriously over-hunted for their tusks.

RHINOCEROS: Big; slow to reproduce; severe poaching for rhino horns; habitat is also being converted for human use. 95% of the rhinoceros population was lost between 1970 and 1988.

HARTMANN'S MOUNTAIN ZEBRA: Big; found in small area; hunted by farmers because they thought it competed with cattle for food.

HUMBOLDT PENGUIN: Nesting habitat destroyed (guano extracted); killed by fishermen who see penguin as competition for fish; killed as food.



Background Information

Look in the Teacher Information Packet under What is *Extinction/ Why are Species Endangered?* for more information about reasons for endangerment. Specific information about each animal can be found in the *Endangered/ Threatened Animal Profiles.*

"Hang Out" with the Monkey Kids

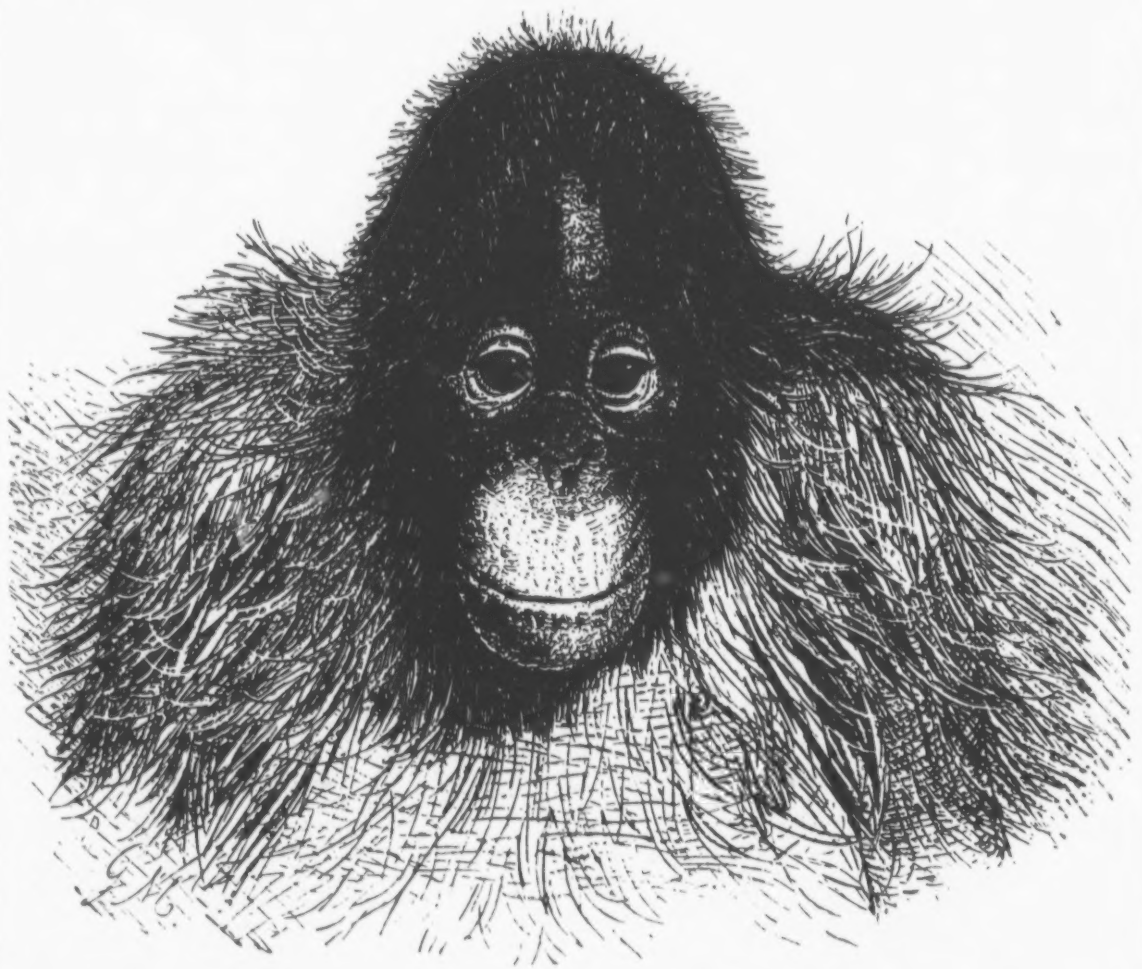
ZOO EXHIBITS TO VISIT: Primates

Directions

1. Choose one kind of monkey or ape from each of the following three groups.

- 1 old world ape:
  orangutan, siamang, white-cheeked gibbon, chimpanzee
- 1 old world monkey:
  colobus, mandrill, Diana monkey, Hanuman's langur, Francois leaf-monkey
- 1 new world monkey:
  black-tailed marmoset, brown-headed tamarin, red-handed tamarin

2. Observe a "kid" monkey/ape, either an infant or juvenile, for no less than 5 minutes. Fill in the chart with your observations. If you witness a behavior not listed, write it under "Other." If you see only adults, note this on the chart.



"Hang Out" with the Monkey Kids

Your Name: Date and Time of Day:

When you check a "yes" box, go on to the next boxes.

Primate Kid	Feeding	Moving Around	Playing	Fighting/Arguing	Grooming	Resting/Sleeping
	☐ No ☐ Yes What? Where? How? Other _____	☐ No ☐ Yes ☐ Climbing ☐ Jumping ☐ Swinging ☐ Walking ☐ Other ____	☐ No ☐ Yes ☐ with toys ☐ Teasing ☐ Tickling ☐ Chasing ☐ Wrestling ☐ Other _____	☐ No ☐ Yes ☐ Screaming ☐ Hitting ☐ Dragging ☐ Other _____	☐ No ☐ Yes ☐ Self ☐ Adult ☐ same age or younger	☐ No ☐ Yes ☐ Alone ☐ With adult ☐ With other kids ☐ Other _____
	☐ No ☐ Yes What? Where? How? Other _____	☐ No ☐ Yes ☐ Climbing ☐ Jumping ☐ Swinging ☐ Walking ☐ Other ____	☐ No ☐ Yes ☐ with toys ☐ Teasing ☐ Tickling ☐ Chasing ☐ Wrestling ☐ Other _____	☐ No ☐ Yes ☐ Screaming ☐ Hitting ☐ Dragging ☐ Other _____	☐ No ☐ Yes ☐ Self ☐ Adult ☐ same age or younger	☐ No ☐ Yes ☐ Alone ☐ With adult ☐ With other kids ☐ Other _____
	☐ No ☐ Yes What? Where? How? Other _____	☐ No ☐ Yes ☐ Climbing ☐ Jumping ☐ Swinging ☐ Walking ☐ Other ____	☐ No ☐ Yes ☐ with toys ☐ Teasing ☐ Tickling ☐ Chasing ☐ Wrestling ☐ Other _____	☐ No ☐ Yes ☐ Screaming ☐ Hitting ☐ Dragging ☐ Other _____	☐ No ☐ Yes ☐ Self ☐ Adult ☐ same age or younger	☐ No ☐ Yes ☐ Alone ☐ With adult ☐ With other kids ☐ Other _____

"Hang Out" with the Monkey Kids

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.6
2.0 Processes: 2.1, 2.5
5.0 Values: 5.3

Objectives

- Collect information about primate behavior by observing the young of several species.
- Compare Zoo primate behavior with student behavior.
- Introduce one important function of the modern zoo: breeding and raising of endangered animals in accordance with an international species survival program.

Directions

IN THE CLASSROOM

1. Make copies of the *Hang Out with the Monkey Kids* chart for each student.

2. Instruct students to keep a list of the different types of behavior they observe in their class or in their school for one full day. To get them started, give them the general categories on the data collection sheet with this activity: Feeding, Moving around, Playing, Fighting/ Arguing, Grooming and Resting/ Sleeping. Students should bring this list to the zoo with them.

AT THE ZOO

1. Instruct students to choose one monkey and/or ape from each of the three groups. If you have time, have the students look at the label in the primate house that lists many of the differences between old and new world monkeys.

2. Students fill in the Monkey Kids Chart. They might take special notice of any behavior not on the chart that resembles the behavior of their classmates from their lists.

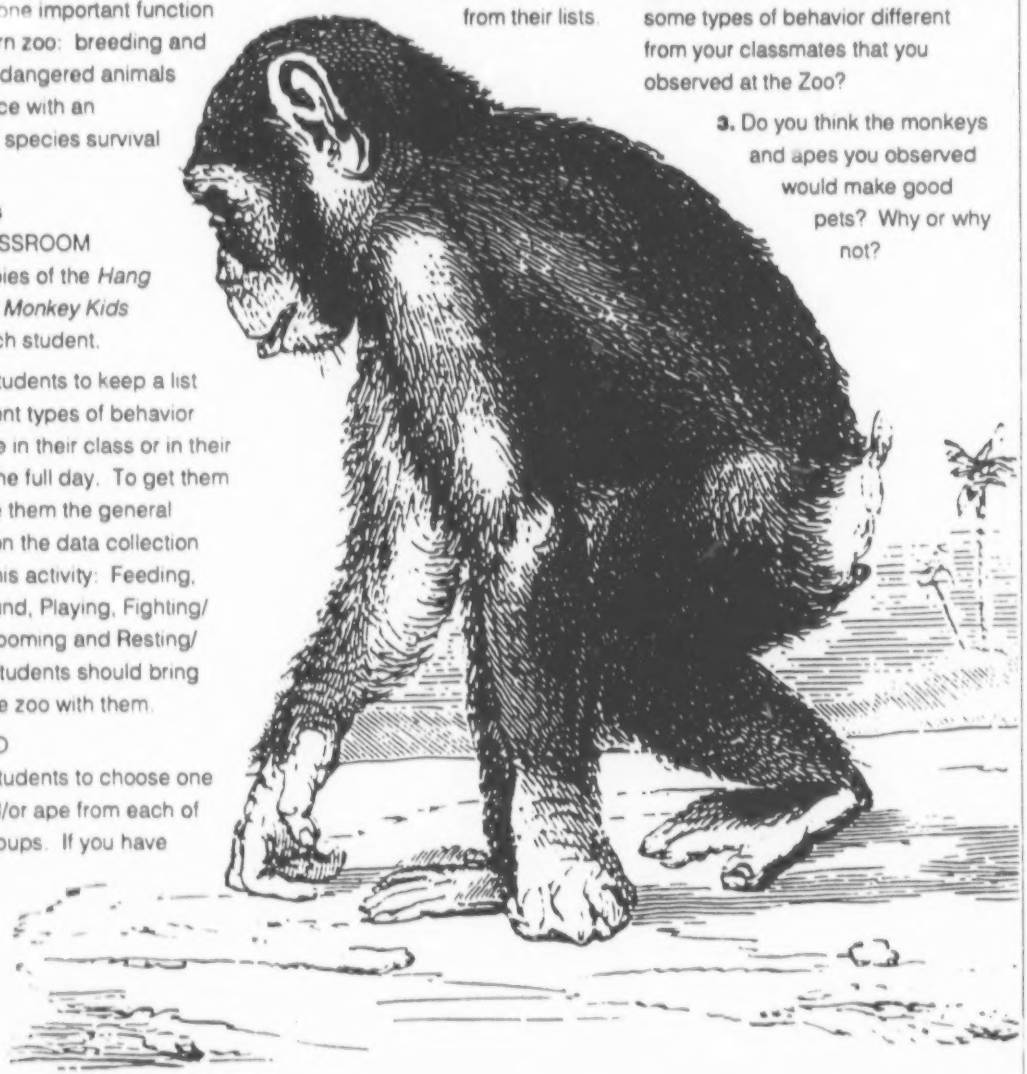
BACK IN THE CLASSROOM

Discuss the following:

1. The Zoo thinks it is very important to have young monkeys and apes here. Why would the Zoo think this way?

2. Did your classmates and the Zoo primates you observed behave in similar ways? If so, how? What are some types of behavior different from your classmates that you observed at the Zoo?

3. Do you think the monkeys and apes you observed would make good pets? Why or why not?



Answer Key

BACK IN THE CLASSROOM

1. The Zoo finds it important to keep breeding groups of primates because most primates, except for humans, are extremely endangered in their natural habitat. Zoo populations may be the last survivors of certain species such as the orangutan and the white-cheeked gibbon. The Zoo participates in Species Survival Plans (see *The Zoo and Endangered Animals* and *Alphabet Soup*) for these primates: chimpanzees, orangutans and ruffed lemurs and shares information on other species with other zoos.

2. Comparing student and primate behavior can lead to a discussion of ourselves as primates. Acknowledging ourselves as animals gives us another key to understanding the natural world and to acting in ways necessary to continue the survival of animal species.

3. Contrary to the popular media, primates, such as chimps, orangutans and gibbons, do not make good pets. Cute babies grow into powerful and uncontrollable adults that can't be housebroken. Remind students of the size, strength and wild behavior of the adults. One reason for depletion of wild stocks of many primates is because people think that they will make "cute" pets. In collecting young primates in the wild, the mothers and other family members often are killed.

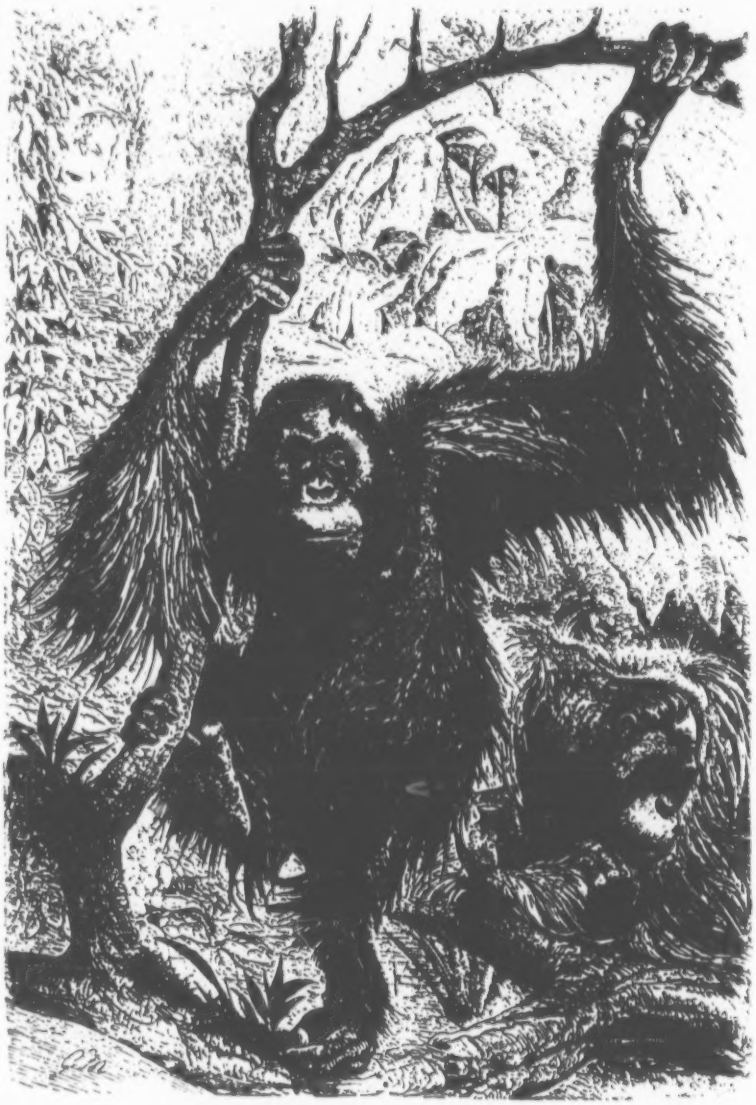
Background Information

An African biologist, Baba Dioum, said, "In the end, we will conserve only what we understand, we will understand only what we are taught." The "babies" of most species, but primates in particular, seem to appeal to humans, young and old. Making careful observations of the appealing primate infants and adolescents should bring an appreciation of their behavior and social structure. The hope is that this generation of students will look for ways to protect those appealing youngsters that they observed and were taught to understand.

Of the different types of biomes or vegetation zones on the globe, the rainforests are the most endangered. Most primates live in tropical rainforests in both the new and old world. The relatively large size and tree dwelling habits of primates make them among the best indicators of the health of the forests in which they live. Non-human primates are one of the most endangered groups of animals in the world.

BEST COPY AVAILABLE

Where the Monkey Kids Live . . . or How to Make the Zoo a Home



ZOO EXHIBITS TO VISIT: Primates

Directions

1. Choose the Zoo home of one monkey/ape from each of the following three groups:

- 1 old world ape: orangutan, siamang, white-cheeked gibbon, chimpanzee
- 1 old world monkey: colobus, mandrill, Diana monkey, Hanuman's langur, Francois' leaf-monkey
- 1 new world monkey: black-tailed marmoset, brown-headed tamarin, red-handed tamarin

2. Visit your three primate choices and fill in the chart. Information can be gathered both from observations of the "habitat," (Zoo home), and from the labels.

Where the Monkey Kids Live

Your Name: Date and Time of Day:

Primate Kid Home	Food	Number of primates/ Size of space (length x width x height)	Toys	Natural or Artificial Light	Shelter	Inside or Outside
	Food? How much?	Number? Estimate space size (length x width x height)	What kind?		Sleeping places Nest-making material?	Is there both? Open passage between?
	Food? How much?	Number? Estimate space size (length x width x height)	What kind?		Sleeping places Nest-making materials	Is there both? Open passage between?
	Food? How much?	Number? Estimate space size (length x width x height)	What Kind?		Sleeping places Nest-making material?	Is there both? Open passage between?

Where the Monkey Kids Live . . . or How to Make the Zoo a Home

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.1, 1.2, 1.6, 1.11
2.0 Processes: 2.1, 2.3, 2.5, 2.13
5.0 Values: 5.5
6.0 Interactions: 6.4

Objectives

- Observe the components of a Zoo "habitat" containing primates.
- Predict primate behavior in a Zoo "habitat" slightly changed from the one observed.
- Understand the relationship between changes in the natural habitat and the continued survival of primates.

Directions

IN THE CLASSROOM

Make copies of the chart, *Where the Monkey Kids Live*, for each student. Have the students practice estimating distances and calculating space with the length x width x height formula.

AT THE ZOO

1. Instruct students to choose the Zoo homes of one monkey and/or ape from each of the three groups.

2. You may want to limit their choices to the same primates they observed in *Hang Out with the Monkey Kids*. Observations of the same primates and Zoo homes provide a more in-depth study.

BACK IN THE CLASSROOM

1. Read or paraphrase for students the following.

You've now observed behavior of some young primates in their Zoo "habitat" and the "habitat" itself. Try to "guess" or, as scientists call it, "make inferences" about monkey/ape behavior and health if conditions in the Zoo "habitat" changed.

2. Use the following questions as discussion or paper and pencil activity.

What might happen if...

1. ...another 5 primate adults are added to the same space?
2. ...5 more juveniles are added?
3. ...climbing and swinging structures are removed?
4. ...little variety in food is offered?
5. ...less food is available for the same size group?
6. ...movement between inside and outside is prevented?
7. ...apes/monkeys are put in isolation?
8. ...5 individuals are removed randomly every year?
9. ...all males are removed from the family group?

3. Make a comparison between zoo habitat changes and natural habitat changes.

What changes in primate behavior and health in a *natural* habitat might happen if some of the same conditions as in the "what if" scenarios occurred? Have students compare changes in natural habitats to changes in Zoo "habitats." Discuss how changes in habitat impact the continued survival of animal species.

Answer Key

BACK IN THE CLASSROOM

Scenarios other than the ones listed below may also have validity.

What might happen if...

1. ...another 5 adults are added to the same space?

Monkeys and apes are extremely social and link themselves in extended families. If unrelated adult monkeys are added, the social system already in place would be disturbed, at least temporarily, until a new equilibrium is established.

Math Extension: You may suggest that your students calculate how much space per primate existed before these adults are added. Students may estimate the square footage of the Zoo "habitat" (entered on the chart of Zoo data) and divide by the number of individuals.

2. ...5 more juveniles are added?

Would more young monkeys put extra pressure on the caretaking adults?

3. ...climbing and swinging structures are removed?

Many monkeys and some apes live in the understory of rainforests. They find food, water and activity above the forest floor. Their eating, sleeping and playing habits would change if they could no longer climb and swing.

4. ...little variety in food is offered?

Their health and interest in food may be affected.

5. ...less food is available for the same size group?

Squabbling over food might result. The young and weak might be deprived of food and become sick and die.

6. ...movement between inside and outside is prevented?

Stimulation would be reduced. If primates were confined inside, would their ability to adapt to temperature changes be affected? If they never came inside, perhaps their behavior would not change at all (this depends on student observations of the differences in the inside and outside Zoo homes).

7. ...apes/monkeys are put in isolation?

Since most monkeys and apes are extremely social, an isolated primate may develop abnormal behavior. Solitary pet chimps that are then introduced to zoo troops exhibit atypical behavior.

8. ...5 individuals are removed randomly every year?

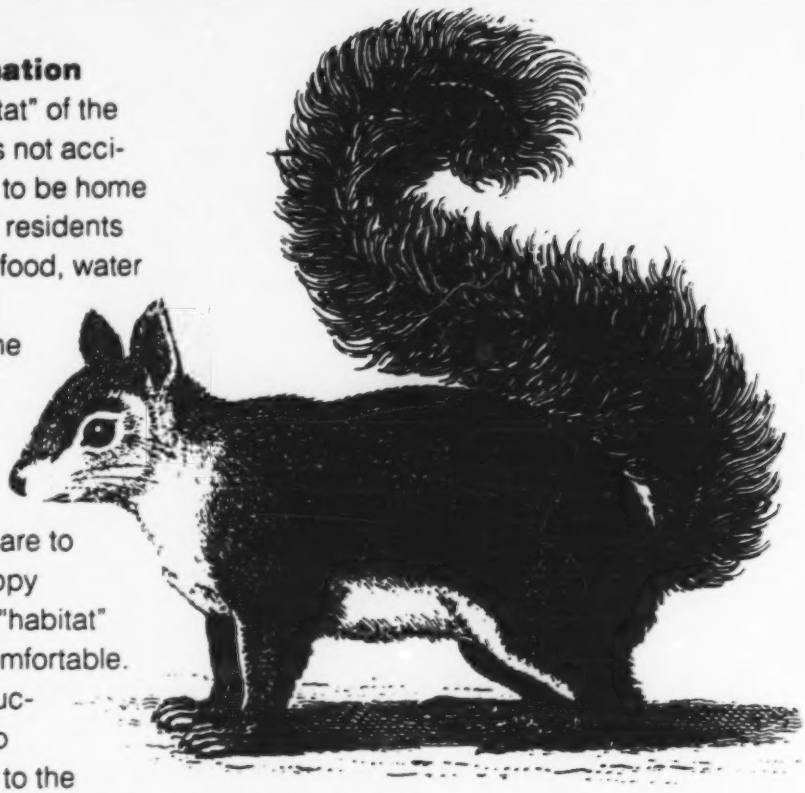
If the zoo population were large enough to reproduce 5 babies every year, the population would remain stable and not grow. However, if less young were born, eventually the zoo population might die out.

9. ...all males are removed from the family group?

Since the orangutan male does not usually live in a family group, this unit might not be affected. In other units, would the behavior of the remaining females and young change? This question can lead to interesting speculation about sex roles in primates.

Background Information

The Zoo home or "habitat" of the monkeys and apes was not accidental. It was planned to be home to a specific number of residents and to provide shelter, food, water and activity. Please let students know that some feeding and holding areas are not visible to the public. If zoo populations of animals such as primates are to remain healthy and happy enough to breed, their "habitat" must be secure and comfortable. The good health and successful breeding of Zoo primates are testimony to the success of primate homes. Washington Park Zoo "habitats" and natural habitats have many common elements.



Most of us will not have an opportunity to observe changes in exotic natural habitats that are stressing populations of animals and making their long term survival uncertain. But students can observe animal behavior in a comfortable Zoo habitat, imagine changes of that habitat and infer resulting changes in animal behavior. It is hoped that this exercise will encourage more careful observations of potential changes in the natural habitat within such easy reach of residents of the Northwest and the impact on the animals (and plants) in those habitats.

A Step Further

1. Habitat Changes Closer to Home

Discuss otters (or squirrels or other local fauna) that live in the Cascade forests. Set the scene with a healthy and active population of otters who eat fish, frogs and insects and live near mountain streams. What would happen if...

...the stream became polluted?

...a ski resort diverted the stream?

...the forests next to the stream were logged?

...otters were hunted for their fur or as pets?

2. Primate Habitats

Have students generate a list of some human-controlled changes in the natural habitats of primates. You may want to start by making a map showing geographical location of many of the Zoo species. Use the *Animal Profiles* in the Teacher Information Packet to find specific reasons for the endangerment of the Zoo primates.

What is Wet and has Trees? . . . the Rainy Forest in Your Backyard!

Directions

1. Visit either the tropical rainforest animals or the Cascade forest animals (you will be assigned to one). Note that these Zoo tropical rainforest animals do not live in the same rainforests in the wild but on different continents.

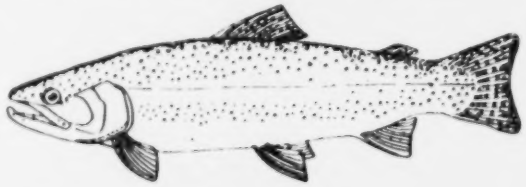
2. Fill in the chart by watching the animals and by reading the labels. You may need to finish the last column "Human Use/Impact?" back in class.

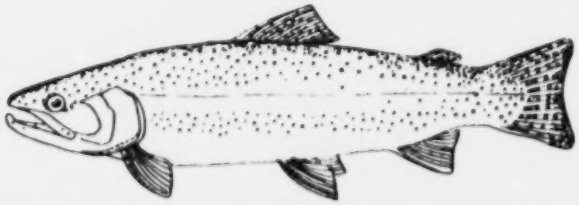
What is Wet and has Trees?
. . . the Rainy Forest in Your Backyard!

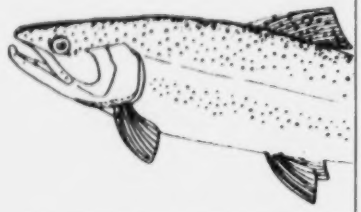
CASCADE TEMPERATE FOREST AND WETLANDS ANIMALS

ZOO EXHIBITS TO VISIT: Cascade, Artic Tundra

Not present at Zoo	Animal	Still live in Cascades?	What do I eat?	What eats me?	Human Use/Impact
	Beaver				
	Otter				
	Rainbow Trout				
	Red-legged Frog				
	Mallard Duck				
	Crayfish				
	Gray wolf				
	Water ouzel				
	Grizzly bear				
	Harlequin duck				
	Caddis fly larvae				
	Cutthroat trout				
	You, yourself				







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What is Wet and has Trees?
. . . the Rainy Forest in Your Backyard!

TROPICAL RAINFOREST ANIMALS

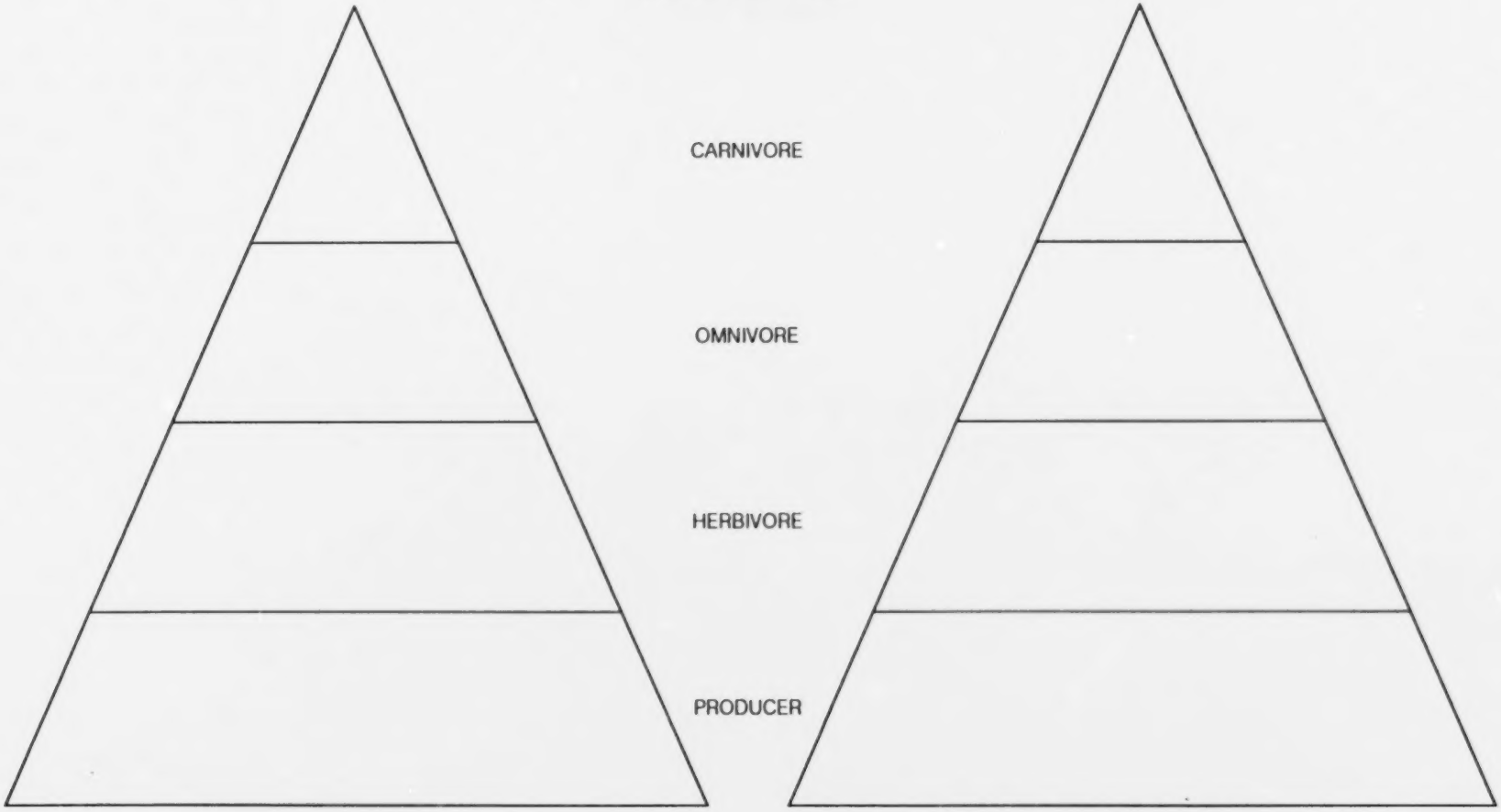
These rainforest animals are found in different rainforests on different continents in the wild.

ZOO EXHIBITS TO VISIT: Felines, Africa Rain forest, Primates, Zoo grounds (peacock), Bears, Elephants

Not present at Zoo	Animal	Where is the Rainforest?	What do I eat?	What eats me?	Human Use/Impact
	Jaguar				
	Fruit Bat				
	Peacock				
	Ring-tailed lemur				
	Geoffrey's cat				
	Python				
	Siamang				
	Quetzal				
	Sunbear				
	Gibbon				
	Elephant				

What is Wet and has Trees?
. . . the Rainy Forest in Your Backyard!

FOOD PYRAMIDS



Tropical Rainforest

Cascade Temperate Forest

What is Wet and has Trees? . . . the Rainy Forest in Your Backyard!

CLASSROOM AND ZOO ACTIVITY

1.0 Concepts: 1.1, 1.5, 1.11, 1.12
2.0 Processes: 2.1, 2.5, 2.14
5.0 Values: 5.6
6.0 Interactions: 6.4

Objectives

• Compare more familiar forest animals of the Cascades to more exotic tropical rainforest animals.

• Encourage student understanding that diffe rent plants and animals in the two forests occupy similar positions on a food web.

• Understand that both forest habitats are endangered by similar threats to their animals.

Directions

IN THE CLASSROOM

Make a copy of either the rainforest animal chart or Cascade forest animal chart for each student.

AT THE ZOO

1. Divide the class into two groups. One will collect data about Cascade forest animals and the other about tropical rainforest animals. Remind students that animals in both groups are found in the exhibits listed at the top of their activity page. Also remind students that the rainforest animals studied here are found in rainforests on different continents.

2. The last column on the chart, entitled, "Human Use/Impact?" cannot always be filled in from Zoo-gathered information. Students can do more research or discuss answers back in class.

BACK IN THE CLASSROOM

Part 1: **Food Web Plant and Animal Lists**

1. Point out to students that most of the animals on their Zoo lists are from the top of the food chain (see *Caught in the Web* activity for more information).

2. Brainstorm with the whole class other plants and animals, lower on the food chain such as insects, reptiles and amphibians, that live in both forests. Write these with the Zoo animals list on the blackboard. See Answer Key for animal and plant lists.

Part 2: **Food Pyramid**

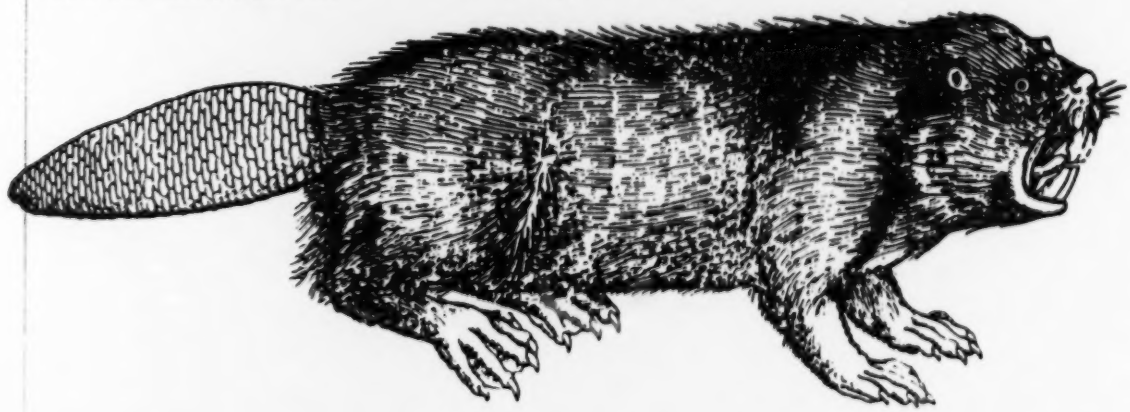
1. Make a copy of the "Food Pyramid " chart for each student.

2. With the class, review concepts of food webs, food pyramids, decomposer, producer, herbivore, omnivore and carnivore. Use the *Glossary* in the Teacher Information Packet and the *Caught in the Web* activity.

3. Instruct students to fill in the "Food Pyramid" chart. Fill in the plants and animals from the blackboard at their correct level on the pyramid.

4. Remind students that the pyramid shape has a "mathematical" purpose as well as a visual one. For example, in the actual forests, there are a greater number of plants than herbivores and more herbivores than carnivores.

5. Compare the pyramids for the Cascade forest and tropical rainforest. Discuss which plants and animals have similar functions in each place.



Part 3: **Impact on the Forest Habitats**

1. Have students research (or you can lead a class discussion) about how the animals on their lists are used by people.

2. Students should have the Cascade forest food pyramid and the tropical rainforest pyramid in front of them.

3. Class discussion: What is the impact on people who use a forest product and on the forest itself of various "what if?" scenarios. Continue to compare both impacts and results between the two types of forests. Refer to the pyramids to answer the following questions. Students should be specific about what plant and/or animal on each pyramid would feel the effects of changes above, below or on its same level.

What on the Cascades food pyramid and the tropical rainforest food pyramid feels the impact if...

...trees, vines and understory plants are cut down?

...bears or large cats are killed for "pest" control?

...herbicides are sprayed in new forests?

...most of the insects die off?

...none of the fruit-bearing trees have fruit one year?

...people disappeared from the forests?

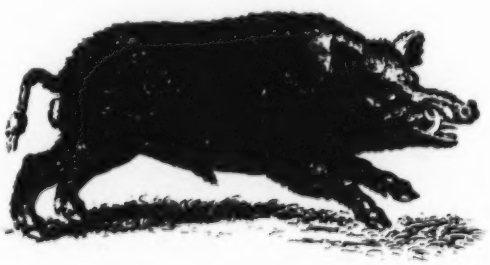
...not much rain fell several years in a row?

...the fish died out?

...the forests were thinned out?

...twice as many roads were cut into the forests?

4. Class discussion/conclusion: How are the two habitats similar? Are the two habitats impacted in similar ways? What are some ways to protect each habitat?



Answer Key

Plants and Animals for tropical rain forest and Cascade forest.

(Includes those from Zoo lists)

CASCADE TEMPERATE FORESTS/WETLANDS

algae	wolf
alligator lizard	deer
beaver	harlequin duck
big-leaf maple	cutthroat trout
caddis fly larvae	water ouzel
cattails	rainbow trout
common garter snake	black bear
diatoms	tadpoles
douglas fir	crickets
mallard ducks	frogs
otter	mollusks
red-legged frog	squirrels
people	water weeds

TROPICAL RAINFORESTS

These animals and plants are from different rainforests on different continents.

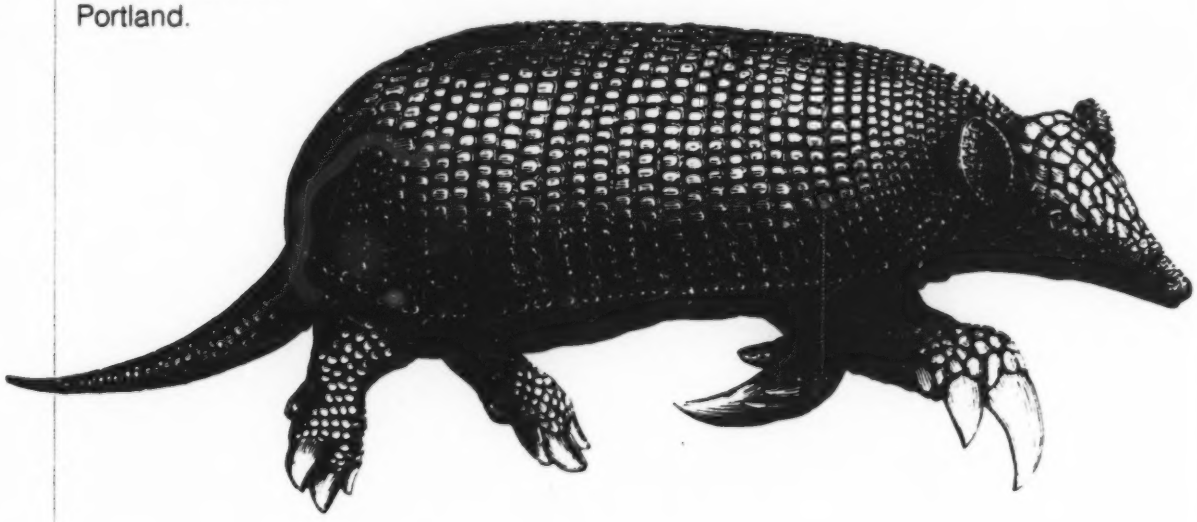
chameleon	elephant
fern	fig vine
fruit bat	geoffrey's cat
jaguar	mahoghany tree
mango tree	orchid
palm tree	parrot
peacock	python
ring-tailed lemur	siamang
people	quetzal
aerial plants	vines
tayra	peccary
forest hog	jungle eagle
tree frogs	sloth
snakes: fer de lance	bushmaster
pangolin	giant armadillo

invertebrates: ants, termites, spiders, scorpions, flatworms, snails, velvet worms, earth worms, leeches

Note: an estimated 155,000 different species of plants live in the tropical rainforests.

Background Information

Where is the first place you remember when you hear about a "rainforest?" . . . the jungles of South America, the wilds of islands with funny names like Madagascar and Borneo? All these places have rainforests but there are others closer to home — the rainforests of western Washington state, western Canada and Alaska. These rainforests aren't tropical but they are thick with plants and trees and shelter a variety of animals that are also found in the Cascades temperate forest a mere 60 miles away from Portland.

Many of us are concerned about the often reported threat to the exotic Amazonian rainforest without realizing that our own Cascade forest is similarly threatened. As the forest habitats fall, so do the animals that live there and form an integral part of the complexity of these environments. Perhaps many zoo visitors are "immune" to the fact that soon there may be more of some types of tropical rain forest animals in zoos than in the shrinking tropical rainforest habitat itself. But would visitors from Oregon and Washington feel the same way if the only place they could see beavers, otters, bears, muskrats, cutthroat trout and native squirrels were in zoos in New York, Detroit, London and Hong Kong?

Use the classroom activity, *Caught in the Web* for more background information about food webs. For different methods of habitat and animal protection, refer to *Protection for Endangered Animals Outside the Zoo* and the *Animal Profiles* in the Teacher Information Packet.